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She's Built For It: Differential Investment Performance in South Africa Based on Gender

by

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Research dissertation presented for the approval of the University of Cape Town Senate in fulfilment of part of the requirements for the degree of Master of Commerce specialising in Finance (in the field of Financial Management) in approved courses and a minor dissertation. The other part of the requirement for this qualification was the completion of a programme of courses.

I hereby declare that I have read and understood the regulations governing the submission of Master of Commerce dissertations, including those relating to length and plagiarism, as contained in the rules of the University, and that this dissertation conforms to those regulations.

Supervisor: Darron West

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Abstract

Research in behavioural finance has shown that individuals do not always behave rationally. As a result of this they do not make investment decisions in such a way as to maximise their expected utility. Certain behavioural biases have been found to explain this behaviour. Furthermore, differences have been observed in how these biases manifest in men and women.

Men have been found to be more overconfident when estimating their own skills and chances of success. Hence, they tend to exhibit stronger self-efficacy and self-attribution biases. Differentials in the risk preferences of men and women are apparent: men display higher risk tolerances and women are more risk averse.

A sample of 19,021 individual investors from a South African investment house was analysed over five years (1 January 2007 – 31 December 2011) in order to draw conclusions on the trading behaviour, resultant returns and variances in returns earned by men and women.

The results showed that there is a statistically significantly negative correlation between trading frequency and investor return. While there is no statistically significant difference in the returns earned by men and women, men trade significantly more and have statistically significantly higher variances of returns than women. Therefore the data suggests that, on a risk-adjusted basis, women are better investors than men.

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Introduction

Gender differences with regards to certain behavioural biases might present differing investment styles and decision-making processes amongst male and female investors. Previous studies (notably Barber and Odean (2001)) have set out how a differential manifestation of some of these biases results in differential investment returns between the genders. The purpose of this dissertation is to determine whether or not such differential investment returns are observable between men and women in South Africa, and whether one gender makes for a better investor than the other.

Relevant literature will be reviewed in chapter 2, starting with the understanding of rational behaviour and the field of behavioural finance. This field will then be further investigated to determine which behavioural biases exhibit the most important instances of differentiation between men and women and what effects the manifestation of these biases have on their investment results. Additional literature will also be reviewed to determine the effect of age on the investment results of men and women.

The findings from the literature review will inform the research questions which will be stated in chapter 3 with the objective of determining whether men or women are better investors. The research approach will be discussed with an explanation of the data sourced for the investigations. The methods applied to the data will also be explained.

In chapter 4, the results of the application of the methods to the data will be presented. These will be described and discussed in detail. Where possible, relevant literature will be referenced in order to offer explanations for any notable findings. Any particular observations that merit additional investigation will be further analysed and the results thereof discussed.

Chapter 5 will set out the resultant conclusions based on the results of chapter 4 and the literature reviewed in chapter 2. Areas offering scope for further study will also be set out.

Literature Review¹

Introduction

Behavioural finance has grown in popularity over the last decade and research has taken off in the field. Of particular interest is that certain research (Barber & Odean, 2001; Bengtsson, Persson, & Willenhag, 2005; Bernasek & Shwiff, 2001; Beyer, 1998; Charness & Gneezy, 2007; Endres, Chowdhury, & Alam, 2008; Estes & Hosseini, 1988; Gysler, Kruse, & Schubert, 2002; He, Inman, & Mittal, 2008; Jianakoplos & Bernasek, 1998; Olsen & Cox, 2001; Schubert, Brown, Gysler, & Brachinger, 1999) has shown that behavioural biases might be different between men and women, and that these gender differentials may have an effect on investing decisions (Barber & Odean, 2001; Charness & Gneezy, 2007). Based on these differentials, certain claims have been made that perhaps one gender-type might make for a better investor than the other. The goal of this research is to explore the effects of gender on investment performance. Relevant literature, starting with the concept that not all traders are rational (Ricciardi & Simon, 2000; Subrahmanyam, 2008) will be reviewed. From there, differing behavioural biases that have developed over time will be reviewed, with particular focus on those that differ between genders.

Rational behaviour

De Bondt and Thaler (1985), Chopra, Lakonishok and Ritter (1992) and Jegadeesh and Titman (1993) have shown that the return history of equity can be valuable in forecasting relative returns and the efficient market hypothesis (Fama & French, 1992, 1993; Fama & Macbeth, 1973) presumes that individuals will behave and make decisions in such a way so as to maximise their expected utility. However, these theories have been unable to explain a number of empirical patterns, such as the stock market bubbles in the U.S., Taiwan and Japan (Ritter, 2003) as well as the financial

¹ Extracts from this chapter have been compiled as a conference paper as yet unpublished at date of submission. These extracts have not been separately identified throughout the chapter.

crisis witnessed in 2008. Furthermore, individuals are thought to be rational, yet certain risk-taking behaviour that is apparent would suggest otherwise (Eckel & Grossman, 2008a; Felton, Gibson, & Sanbonmatsu, 2003; Grinblatt & Keloharju, 2009; Harbaugh, Krause, & Vesterlund, 2002).

Behavioural finance has grown in popularity over the last decade, with research endeavours searching for reasons as to why individuals do not always behave rationally (Ricciardi & Simon, 2000; Subrahmanyam, 2008). There are different aspects to behavioural finance, such as psychology (behavioural and mental processes), sociology (human social behaviour and groups) and finance (determining value and making decisions) (Ricciardi & Simon, 2000).

When individuals are overconfident, place an unreasonable amount of emphasis on prior experiences and act on personal preferences, they have been found to make certain errors in the way they think. This is known as cognitive psychology. The theory of behavioural finance has been built on the assumption that individuals are not fully rational, whether that is due to mistaken beliefs or personal preferences (Ritter, 2003).

A study performed by Friedrichs and Opp (2002) found that individuals made decisions based on their personal preferences and limitations. However, there were certain limitations in Friedrichs and Opp's (2002) study, with one being that Friedrichs and Opp (2002) tested decisions made by individuals in 'everyday behaviour' i.e. activities that are performed regularly with low opportunity costs and no need to perform calculations. Friedrichs and Opp's (2002) concluded that it can be assumed that individuals would want to make a decision quickly as well as avoid making a wrong decision (along with the negative consequences that might come with making the wrong decision). Friedrichs and Opp (2002) stated further that cognitive constraints are present which would affect an individual's abilities to process relevant information but that whilst taking part in 'everyday behaviour' it could be likely that individuals have stored any necessary information related to that task.

Furthermore, Friedrichs and Opp's (2002) sampled study ranged from 13 to 21 individuals and standardised questionnaires were used. This might not be seen to be

representative of the general population and doesn't allow for any analysis into the actual decision making process that an individual might be going through.

Behavioural biases that manifest

In a study by Pompian and Longo (2004), a Myers-Briggs Type Indicator® personality test and questionnaire was administered to 100 investors, in an attempt to uncover investor biases. The results showed that men and women are considerably different in their susceptibility to differing behavioural biases. Pompian and Longo (2004) found that intuitives, introverts, feelers, judgers and women tolerate less risk than their personality type and gender opposites.

Out of all the behavioural biases that this literary review researched, it was found that overconfidence (Barber & Odean, 2001; Bengtsson et al., 2005; Bhandari & Deaves, 2006; Estes & Hosseini, 1988; Gysler et al., 2002; Hira & Loibl, 2008; Powell & Ansic, 1997; Subrahmanyam, 2008), self-efficacy (Barber & Odean, 2000, 2001; Biais, Hilton, Mazurier, & Pouget, 2005; Busch, 1995a, 1995b; Chen, Greene, & Crick, 1998; Endres et al., 2008; Gysler et al., 2002; Hira & Loibl, 2008; Jones & Tullous, 2002; Lewellen, Lease, & Schlarbaum, 1977; Rammstedt & Rammsayer, 2002), self-attribution (Barber & Odean, 2001; Beyer, 1998; Minter, Gruppen, Napolitano & Gauger, 2005) and riskiness (Bernasek & Shwiff, 2001; Block, 1983; Charness & Gneezy, 2007; Croson & Gneezy, 2009; Eckel & Grossman, 2002, 2008a; Feng & Seasholes, 2008; Hira & Loibl, 2008; Holt & Laury, 2002; Jianakoplos & Bernasek, 1998; Levin, Snyder, & Chapman, 1988; Moore & Eckel, 2003; Olsen & Cox, 2001; Pompian & Longo, 2004; Powell & Ansic, 1997; Schubert et al., 1999; Sunden & Surette, 1998; Yao & Hanna, 2005; Zinkhan & Karande, 1991) to be those that displayed the strongest difference between men and women. Furthermore, the literature reviewed showed that the time it took to make a decision (Powell & Ansic, 1997), the use of resources (Hira & Loibl, 2008; Loibl & Hira, 2006, 2011), the time spent in the market (Powell & Ansic, 1997), the inclination to sell (Barber & Odean, 2001; Feng & Seasholes, 2005, 2008) as well as the frequency of trading (Agnew, Balduzzi, & Sunden, 2003; Baker, 2010; Barber & Odean, 2001; Feng & Seasholes, 2005, 2008; Hira & Loibl, 2008; Odean, 1999) to also present some particular gender

differentials. The rest of this literature review will focus on each of these behavioural issues in more detail.

Overconfidence

A human being, being egoistic, will strongly believe that their chosen actions are essential in the further advancement of their goal (Friedrichs & Opp, 2002), and tend to overestimate his or her own skills and chances of success (Cheng, 2007; Rammstedt & Rammsayer, 2002; Ricciardi & Simon, 2000).

Evidence of overconfidence was found in a study by Fischhoff, Slovic and Lichtenstein (1977) whereby a group of people were asked to assign a percentage to whether they thought they got an answer right or wrong whilst answering general knowledge questions. The results showed extensive consistency of overconfidence. In a study over two decades later, Barber and Odean (2001) found the same results among investors in a discount brokerage house.

Benos (1998) found that overconfidence came about from an individual overestimating the accuracy of his or her own information. This overestimation could then lead to overly positive self-evaluations, which are often unrealistic (Weinstein, 1980), resulting in overconfidence.

Estes and Hosseini (1988) found that when it came to the realm of investment decisions, confidence was mostly explained by gender. After controlling for age, education, ability, experience and when the expected outcomes of the different investments were held equivalent, women's confidence was found to be lower than that of men.

A decade later, a study performed by Powell and Ansic (1997), in which participants earned remuneration dependant on a contingent outcome, was followed by a survey in order to assess the participants' responses. The results showed that women felt less confident at the beginning of the study and were more disposed to attribute any good performance to luck. This was found regardless of their prior experience or education. Irrespective of the consideration the participants earned from the study, no difference was found between their perceptions of their performance.

Gysler et al. (2002) found that men were significantly more confident than women in both the high and low knowledge groups. Men tended to be more over-confident in the low knowledge group and fairly accurate in their self-knowledge in the high knowledge groups, whilst women tended to be under-confident in the high knowledge group. A willingness to play lotteries is higher for men than it is for women. This can be seen as an area in which uncertainty exists in the probability of distribution i.e. there is uncertainty involved in what the outcome will be, which is known as ambiguity. This differs to an investment realm in which an individual has a certain level of control over the outcome. In an ambiguous realm, Gysler et al. (2002) found that as knowledge increases men became more risk or ambiguity averse and therefore less likely to play the lottery, whilst women became more risk or ambiguity prone and more likely to play the lottery. These results imply that with an increase in knowledge, the corresponding difference between men and women's confidence levels and their willingness to play the lottery is reduced. In a financial decision making context in which a certain level of ambiguity exists, an increase in knowledge could result in women becoming more ambiguity and risk prone and result in a narrowing of the gap between men and women's attitudes towards uncertainty (Gysler et al., 2002).

With no notable differences observed between men and women's investment knowledge, Bhandari and Deaves (2006) found that Canadian male pension plan participants were more overconfident than their female counterparts.

Another interesting study was performed by Bengtsson et al. (2005) on students at Stockholm University, over five Microeconomics I exams, from the Fall Term in 2001 through to the Spring Term of 2004. The exam consisted of four questions and the students could earn one of three marks; Very Good (VG), Pass (P) or Fail (F). In order to earn a P for the exam, a student needed to get a P for all four questions. In order to earn a VG, a student needed to get a VG on all four questions and then give an acceptable answer for a fifth optional question. No matter how good a student's answer was for question five, he or she would not be awarded a VG if he or she didn't earn VG's for the first four questions. Once a student had finished answering all four questions, he or she wouldn't know how well he or she had done in order to determine

whether it was worthwhile answering question five or not. Naturally, if he or she scored a P on any of the four questions, there was no incentive for him or her to answer the fifth question. The decision as to whether he or she should answer the fifth question was determined based on his or her own perception of how well he or she had done in the first four questions. The results showed that 78.8% of the women passed the exam and 11.8% earned a VG grade. 76.5% of the men passed the exam and 16.1% earned a VG grade. This showed that women were better at passing the exam, whilst men were better at earning the VG grade. 480 men qualified to write the fifth question, of whom 87.1% took the opportunity, whilst 506 women qualified to write the fifth question, of whom 83.8% took the opportunity. These results showed that more women than men had the opportunity to earn a VG grade, whilst more men perceived they had this opportunity and took it up. The population tested in this study was further divided between age groups and the results remained the same, albeit the difference was seen to be larger, the younger the men and women were (Bengtsson et al., 2005).

In an attempt to identify significant personal and environmental factors that influence investment behaviour, based on gender, the following results were found by Hira and Loibl (2008):

- Men found investing more exciting (70% of men vs. 62% of women) or satisfying (81% of men vs. 78% of women).
- Women tended to find investment decisions more stressful, difficult and time-consuming and emphasised the mental efforts and time required in making investment decisions.
- Men felt more confident (70% of men vs. 50% of women) or knowledgeable (70% of men vs. 50% of women) regarding investments and indicated that they regularly review their performance against relevant benchmarks (66% of men vs. 49% of women).
- Men were found to be more confident in their investing abilities (70% of men vs. 62% of women). Women's confidence equals that of men's when feedback is immediate and clear. The stock market, however, is an area which is very

ambiguous and uncertain and this influences a women's opinion of herself in the sense that her confidence in investment decisions is lower.

- Men were more likely to make investment changes when they found that their investment did not deliver the returns that they were expecting. This behaviour supports Barber and Odean's (2001) study that men hold unrealistic beliefs about how high their returns will be, due to their inherent overconfidence and are more impulsive and willing to act on too little information.

Overconfidence has also been analysed outside the United States and Grinblatt and Keloharju (2009) found the overconfident investors were more disposed to sensation seeking and thus traded more regularly. This overly excessive trading has been found to negatively affect performance (Odean, 1998; Sieck & Arkes, 2005).

Barber and Odean (2001) found that women perform better than men in their individual stock investments owing to men trading more and incurring friction costs as a result of their overconfidence. This behaviour was characterised by Subrahmanyam (2008) as being akin to the caveman days where men were required to be overconfident and take on risk when hunting in order to survive.

De Long, Shleifer, Summers and Waldmann (2010) found that overconfident traders underestimate risk and consequently hold high-risk, high-return portfolios. These traders were found to perform better because of the "overreaction in their assessments of mean, so that these investors exploit their information more aggressively in either a long or short direction" (De Long et al., 2010).

Similarly, Hirshleifer and Ying Luo (2001) stated that overconfident traders should perform better than rational traders as they are able to take advantage of opportunities that are more risky. They underestimate risk, trade more aggressively and hold riskier assets. Riskier assets, in turn, deliver higher returns, which would result in overconfident traders performing better than rational ones. This result, however, would only hold true in the short run. If there are too many overconfident traders, prices will be pushed up or down and rational traders will benefit from this, bringing all things back into equilibrium (Hirshleifer & Ying Luo, 2001). In contrast to this,

Hirshleifer and Ying Luo (2001) do not account for a situation where overconfident traders consistently choose aggressively, but incorrectly.

Hirshleifer and Ying Luo (2001) hypothesise that over time and experience, an overconfident trader will realise that they overestimate and overreact and adapt from this. This, however, has not been proven which implies self-attribution bias which will be discussed further in the next section.

Self-efficacy and self-attribution bias

Self-efficacy relates to an individual's belief in his or her own competence (Busch, 1995a, 1995b). Self-attribution bias is a phenomenon whereby humans tend to attribute any successful outcomes to skill and any unsuccessful outcomes to bad luck (Hirshleifer & Ying Luo, 2001).

Men have been found to perceive their capabilities higher than women do in a number of different areas such as mathematics (Rammstedt & Rammsayer, 2002), complex computer tasks (Busch, 1995b), computing and marketing knowledge (Busch, 1995a), entrepreneurial activities (Chen et al., 1998), cognitive ability (Rammstedt & Rammsayer, 2002) as well as in financial decision making (Barber & Odean, 2000, 2001; Biais et al., 2005; Gysler et al., 2002; Jones & Tullous, 2002).

Men's overconfidence has been suggested in self-estimated intelligence (Furnham, 2001). Men tend to constantly estimate their actual own intelligence to be higher than that of women, even though actual results do not support this presumption. This result was supported by a study performed by Rammstedt and Rammsayer (2002). Conventional intelligence i.e. IQ did not differ between men and women and it was found that men actually outperformed women only in the field of mathematics (Endres et al., 2008).

Using a complex financial decision task, Gysler et al. (2002) found that men initially perceived that their knowledge of a task was higher than women did, regardless of whether they had acquired the necessary knowledge to perform the task. It was further found that as men acquired the relevant knowledge, they become less confident in their own abilities and more risk-averse.

In another study, male entrepreneurs reported higher confidence than female entrepreneurs when making financial decisions. Also, male entrepreneurs' estimation of whether they required financial consulting was lower (Jones & Tullous, 2002). Being more overconfident though, it would imply that men are the ones that probably require the professional advice more (Endres et al., 2008).

Men and women have been found to be different in the way in which they perceive their own abilities and when setting personal goals to predict future performance. Men's goals were considerably more challenging than women's and their self-efficacy was significantly higher than women's. While both men and women were found to underrate their personal goals and self-efficacy, women were found to be significantly less confident (Endres et al., 2008).

While both men and women expect that they will outperform the market with their portfolios, men expect that they will outperform to a greater extent (Barber & Odean, 2001). Men have been found to make more frequent transactions, spend more time and money on security analysis, rely less on brokers, anticipate higher returns and believe that returns are more predictable than women do (Hira & Loibl, 2008; Lewellen et al., 1977).

Psychology literature has also shown that gender differentials exist in individual perception of abilities. Women have been found to underestimate their abilities more than men, and this difference is more pronounced in tasks which are perceived to be more male-specific. Investing is an example of an environment which is more male-specific as it has historically been dominated by males (Barber & Odean, 2001). It would follow from this that a women's perception of herself would be even lower in a task such as investing because when women perform a task well, Minter et al. (2005) found that they attributed it to good luck, whilst men attributed it to their skill. However, when women performed a task poorly, they attributed it to their lack of skill, whilst men attributed it to bad luck.

In a study that considered 213 male and 275 female college students, no gender differences were noted in the students' perception of themselves in tasks which were seen to be either neutral or feminine. In tasks which were perceived as more

masculine, however, women underestimated their performance and showed a more conservative response bias. Women were also found to be more likely to remember their mistakes and, as such, were shown to have a stronger negative recall bias (Beyer, 1998).

With the self-serving attribution bias being more apparent in men, it would follow that men would be more overconfident than women (Barber & Odean, 2001).

Time taken to make a decision and the use of resources

Powell and Ansic (1997) found that men take much longer in making a decision than women do and partly explained this by the fact that men tend to use information when making decisions as well as use more than one strategy which is time-consuming. Powell and Ansic (1997) further found that men place too much value on the current state of the world than women do. When it came to making a random decision or guessing though, no differences were noted between men and women (Powell & Ansic, 1997).

Gender differences in the type of information sources and frequency of using these sources by men and women is further supported in a study by Loibl and Hira (2011). Women investors were found to be more inclined to adopt a lower-information search strategy, which meant using fewer mass media and online sources, in comparison to men. Women have also been found to prefer getting investing information from financial advisors, whilst men tended to prefer trying to figure it out on their own (Hira & Loibl, 2008; Loibl & Hira, 2006).

Time spent in the market and the inclination to sell

Regardless of the costs involved (whether sunk or not), women have been found to stay in the market for a lesser period of time than men do (Powell & Ansic, 1997). This is explained to an extent by men using multiple strategies and taking a longer time to make a decision (discussed above) as well as their higher tolerance for risk (discussed below). This would indicate that men would require a longer time to be spent in the market (as they take longer to make decisions) and that men have a greater tolerance for this increased exposure (through their higher tolerance for risk).

Feng and Seasholes (2005 and 2008) found that male investors are more likely to sell losers than female investors, whilst Grinblatt and Keloharju (2001) found that gender has no bearing on the inclination to sell. Barber and Odean (2001) again, found that men traded more than women which might imply that the propensity to sell could be influenced by gender.

Risk seeking

There is consistent evidence that gender differentials exist in the risk preference of men and women when it comes to financial decision-making (Powell & Ansic, 1997). Men have been found to buy riskier stock than women (Feng & Seasholes, 2008), whilst women have been found to be more risk averse to gambles (Levin et al., 1988), make smaller investments and consequently appear to be more risk averse (Charness & Gneezy, 2007). Pompian and Longo (2004) found women to be 33% more risk averse than men. A significant determining factor of investment behaviour is an individual's risk tolerance level (Hira & Loibl, 2008) as it influences an investor's investment decision-making process which in turn could influence his or her return.

Bernasek and Shwiff (2001) surveyed 270 faculties at five different universities in Colorado and concluded that the percentage of an individual's retirement fund which is invested in equities was explained by gender. Men were found to hold the higher percentage.

In another study by Hira and Loibl (2008), 51% of men indicated that they preferred taking on risk to earn above-average returns, whilst 69% of the women indicated that they preferred taking average, below-average or no risks with their investments.

A study by Sunden and Surette (1998) using the Federal Reserve's Survey of Consumer Finances (SCF) which reports the demographics and financial characteristics of U.S. families, reported that gender and marital status profoundly affected how individuals chose to allocate assets in defined-contribution plans and further that women were less likely to invest in these plans than men. Jianakoplos and Bernasek (1998) examined the household holdings of risky assets and determined that differences in gender were influenced by age, race, wealth and the number of children

in the household and that women held less risky assets portfolios than men. This conclusion is supported in a later study by Charness and Gneezy (2007).

By using cross-sectional SCF between 1983 and 2001, which encompassed a total of 24,037 households, risk tolerance was investigated over an 18-year period and Yao & Hanna (2005) noted that significant differences existed in the risk tolerances of married and single men and women. Risk tolerance was noted to be the highest for single males, then married males, then unmarried females and lastly married females.

In another study performed on investors in the People's Republic of China, the choice of insurance cover was analysed over a period of time when certain events were taking place, such as damage and disaster. The choice of three possible insurance covers was offered: no cover, damage cover only or disaster cover. The results showed that disaster cover was chosen most often by women and damage cover most often by men. These results were consistent regardless of which event (damage or disaster) took place before the choice was made. (Feng & Seasholes, 2008).

Two theories, biological/evolutionary and social/cultural, have evolved over time in an attempt to understand why women are more risk averse than men. Both have been studied and have been found to be sound suggestions of the phenomenon. From a biologically based evolutionary point of view, women are required to be more conservative. Being child-bearers and mothers, the survival of the human species is dependent on their ability to protect their offspring. Men, on the other hand, in a polygamous environment, are required to take risks to find a mate and obtain the resources necessary to support their family. From a behavioural perspective, risk aversion is really loss aversion and women place a greater amount of emphasis on the downside measures of ambiguity and risk than men do (Olsen & Cox, 2001).

The propensity for risk aversion by women has been documented across cultures. A study by Zinkhan and Karande (1991) found that both American and Spanish female MBA students were less likely than their male counterparts to take on business risks.

Holt and Laury (2002) found that, when considering a low-payoff decision, women were more risk averse than men, but, when considering a high-payoff decision, there

was no difference between the sexes. Moore and Eckel (2003) found that in a gain domain such as an investment gamble, where an individual is attempting to increase his or her wealth, women were significantly more risk-averse than men were. In the loss domain, however, where an individual is attempting to prevent the loss of wealth, women were more risk-seeking as the gambles were framed as insurance decisions.

Gender differences in a choice task were tested by Eckel and Grossman (2002) and the results showed that women were consistently more risk averse than men, regardless of differential framing. This result is supported by Powell and Ansic's (1997) earlier study which concluded that women were less risk-seeking than men regardless of framing, ambiguity, costs or familiarity.

In an experimental study by Eckel and Grossman (2008a) on gender differentials in loss aversion, frames were developed in order to determine whether a women's documented risk aversion was due to her loss aversion or rather her variance aversion. Overall, women, on average, were more risk averse than men in gamble decisions and were found to be four times more likely to choose a risk-free gamble where the standard deviation of the expected payoff was zero and only one-third as likely to choose the highest-risk gamble than men were. No evidence was found to support a greater loss aversion on the part of women and framing was not found to have any effect on the subject's choices. Therefore, loss aversion could not be concluded to be the reason for the differential choices between men and women. Visual clues which subjects in the study obtained from observing one another were used when assessing the risk preferences of others and women were perceived to be significantly more risk averse than men. In general, all subjects in the study were found to under-predict the risk preferences of others, but this under-prediction was found to be greater when risk preferences were identified for women. Regardless of whether men or women were making these predictions, the results didn't change which suggests stereotyping of men and women (Eckel & Grossman, 2008a). A study by Schulman et al. (1999) showed that doctors are less likely to prescribe an aggressive form of treatment for female patients than they would for male patients with the exact same symptoms, owing to this stereotypical perception.

Schubert et al. (1999) found that in controlled economic conditions, females, generally made less risky financial decisions than their male counterparts. The risk propensity of men and women was dependant on the way in which the decision was framed for them. Women were found to be more risk-prone to losses and men more risk-prone to gains. No gender differences in risk preferences were found when an identical decision was presented as an investment or insurance choice. Schubert et al. (1999) concluded that gender differentials in risk behaviour might have arisen in previous studies owing to stereotypical risk attitudes. "In practice, risky financial decisions are inherently contextual. Our findings on contextual financial decisions suggest that preconceptions concerning risk attitudes of female investors and managers may be more prejudice than fact" (Schubert et al., 1999).

Whilst men and women are neither more nor less socially-oriented than the other, social preferences of women are more impressionable and situation-specific than those of men (Croson & Gneezy, 2009). Men are more likely to interpret a risky situation as a challenge whilst women would see that same risky situation as a threat (Croson & Gneezy, 2009). In a challenging environment men are stimulated at the thought of their ego and more inclined to engage in such a situation (Block, 1983), whilst women have been found to be more averse to competition. The competitiveness of an environment has been found to widen the gap between increased participation by men and lesser participation by women. Worth noting, however, is that these differences are weakened by profession and experience. No gender differentials were found in studies with managers and entrepreneurs. It is logical to assume that men would be more inclined to participate in a challenging environment and take on risk (Croson & Gneezy, 2009).

Daruvala (2007) opposes the fact that there is a commonality between gender and risk preference, but supports the stereotyping of women being more risk-averse. Harbaugh et al. (2002) were also unable to find any consistently significant evidence of gender differences in risk aversion. Ackert, Church and Deaves (2003) found that economic factors and emotional disposition affected an individual's risk tolerance and concluded that an individual's attitude towards risk improved when they were in a better mood. Atkinson, Baird and Frye (2003), studying the performance of female

mutual fund managers, concluded that in terms of risk and fund performance, there were no differences between men and women.

Whilst field studies have found that women are more risk-averse than men, laboratory experiments have been less convincing. Amidst the battle to control for factors such as knowledge, marital status, wealth and other demographic factors, these factors could be seen to influence the differences between men and women when it comes to making risky decisions (Eckel & Grossman, 2008b).

Further arguments have arisen that gender effects in decision making are contingent and dependent on each individual's sensitivity to his or her self-efficacy. Empirical studies have found that self-efficacy is positively associated with risk taking and that individuals with a higher belief in their own competence will steer towards taking more risks than those with a lower perceived capability (Wiley, Whytel, Saks, & Hook, 1997; He et al., 2008).

The literature appears to show consistently that gender differentials exist in the risk preference of men and women (Powell & Ansic, 1997) and that men have been found to buy riskier stock than women (Bernasek & Shwiff, 2001; Feng & Seasholes, 2008; Hira & Loibl, 2008). Differences in risk tolerances are noted amongst married and single men and women with single males displaying the highest risk tolerance, followed by married males, then unmarried females and lastly married females (Yao & Hanna, 2005). Whilst both biological/evolutionary and social/cultural theories have been found to be suggestions of the phenomenon (Olsen & Cox, 2001), the risk aversion of women has been noted across cultures (Zinkhan & Karande, 1991), regardless of differential framing (Eckel & Grossman, 2002; Powell & Ansic, 1997) and women have further been found to be perceived by both men and women as the more risk-averse gender (Eckel & Grossman, 2008a).

Over-trading

Agnew et al. (2003) investigated the trading behaviour of 401(k) investors and found that men invested more in equities and traded more actively than women. Men traded 56% more than women, while the average number of annual trades is 0.28 for men and 0.18 for women. Marital status was also found to be statistically significant with

married investors trading more than single investors (0.28 vs. 0.21 times a year). Job seniority and higher salary earnings equated to higher equity allocations which are substantiated by the point that with higher earnings comes larger portfolios and the need to rebalance more regularly. Older participants, in comparison to their younger counterparts, were also found to trade more frequently. Individuals below 35 years of age trade, on average, 0.17 times per year whilst those individuals in the 55-64 years age group trade 0.60 times per year. An exception was noted in the 65 years and older age group, who only traded 0.03 times per year. As an individual approaches retirement their financial wealth should have grown over time and the need to reallocate to safer and lower-risk funds might explain the increased trading activity, while, once retired i.e. over 65 years old, they should merely be withdrawing an annuity from their investment. These models of behaviour appear to be quite rational (Agnew et al., 2003).

Odean (1999) examined 10,000 discount brokerage accounts from January 1987 till December 1993 and found that, on average, investors trade 1.44 times per year, significantly higher than the results reported by Agnew et al. (2003). This could be attributable to the fact that the range of choices within a discount brokerage are significantly higher than in a 401(k) plan. Two years later, Barber and Odean (2001) found women to hold slightly smaller common stock portfolios than men (\$18,371 vs. \$21,975), and that women turned their portfolios only 0.53 times annually in comparison to men who turned theirs 0.77 times annually.

Men were found to be more actively engaged investors than women in a study by Hira and Loibl (2008), with 58% of men (as opposed to 51% of women) indicating that they altered the amounts they had invested in the previous year, and 61% of men (as opposed to 44% of women) indicating that they had altered their asset allocations over the preceding year. Again, a larger percentage of men (45% as opposed to 43% women) indicated that they would change the total amount of money that they planned to invest in the forthcoming six months and 36.1% of men (as opposed to 26% women) indicated that they planned to alter their asset allocation in the forthcoming six months. While both men and women were involved in money management tasks, this was found to be more predominant amongst women (60% as

opposed to 42% men), with more men being in charge of investing-related activities. Similar findings to this are found in Lindamood and Hanna (2005) and Meier, Kirchler and Hubert (1999). Men were found to be more likely to make adjustments to their investments by changing the investment mix or changing the amounts invested, whilst women were more likely to seek advice from a professional (Hira & Loibl, 2008).

Feng and Seasholes (2005) found that men traded more than women but once certain control variables were put in place, gender became less apparent in an individual's propensity to trade. Three years later, Feng and Seasholes (2008) performed another study to determine who would sell a stock first between a man and woman (if they held the same stock). Feng and Seasholes (2008) found that men were 20.73% more likely to sell. This result is significant but lower than the result provided by Barber and Odean (2001) who found that men traded 45% more than women, upon analysing account data from a large discount brokerage house from February 1991 through to January 1997. Barber and Odean (2001) predicted that overconfident traders would trade more frequently than they should and concluded that owing to men being more overconfident than women, men would trade more than women.

Odean (1998) concluded that overconfident traders will believe in a security more than they should and subsequently trade more than could be expected of the theoretical 'rational' trader. The result of this is that traders reduce their expected utility. One year later Odean (1999) again reported that the worst performers are those that trade the most. Barber and Odean (2000) investigated households with accounts at a large discount brokerage house from 1991 to 1996 and found that those investors that traded the most earned an annual return of 11.4%, which was below the market return of 17.9% and concluded that individual investors pay a penalty when trading actively,

Another year later, Barber and Odean (2001) found that both men and women reduced their returns through trading, but that men did so by 0.94 percentage points more than women per year (as their average turnover rate for common stocks was 1.5 times that of women). These differences were more pronounced between single men and single

women, as single men were found to trade 67% more than single women, which in turn, reduced the returns of single men by 1.44 percentage points per year relative to single women.

Baker (2010) supports this view and states that investors obtain below-benchmark performance as a result of frequent trading. This was concluded to be in part owing to the observation that individuals trade stock in a different manner to that which could be expected of the theoretical 'rational' trader. Studies such as Odean (1998), Odean (1999), Barber and Odean (2000) and Barber and Odean (2001) have failed to show that excess returns can be earned from trading as opposed to following a more straight-forward buy-and-hold strategy.

Gender differentials in biases

In the studies analysed above, gender is referred to as a human being's biological sex. Cognisance needs to be given to the social construction of gender though and the notion that the differences in investment behaviours between men and women could be explained by either biological and/or social conditions. Felton et al. (2003) provided experimental evidence that differences in the investment strategies of men and women may be as a result of sub-groups within these gender splits. Masculine characteristics can no longer be applied to men alone and Twenge (1997) reported that the differences between men and women on the masculinity scale have decreased over the years. In a questionnaire-based study on students at the University of Vienna, Meier-pesti and Penz (2008) showed that men still reported a higher identification with masculine attributes than women did. These masculine attributes were found to influence the level of risk taking, whilst feminine characteristics showed no effect. Meier-pesti and Penz (2008) hypothesised that the more female attributes that men displayed, the less they were inclined to take on risk. The more an individual displayed masculine characteristics, such as competitiveness and assertiveness, the more risks they were willing to take. When masculinity was held constant, the difference in investment behaviour between men and women diminished.

Age differentials in biases

Age has been found to have an effect on an individual's investment decisions (Goyal, 2004). The most sophisticated age group which is the least influenced by the disposition effect are the 25 to 35 year olds (Feng & Seasholes, 2005). The disposition effect can be defined as the behaviour whereby investors seek to realise paper gains and avoid realising paper losses (Ritter, 2003). Barber and Odean (2001) found that the young and single, as well as individuals with high income, hold more volatile portfolios and are more willing to take on risk. Barber and Odean (2001) also reported that monthly turnover decreases by 31 basis points per decade that an individual ages.

Korniotis and Kumar (2011) found that the older and more experienced investors are, the less they traded, the fewer behavioural biases they displayed and the less risky were the portfolios they held. Amidst this though, due to cognitive aging, their skill at investing had worsened with a sharp drop being seen at age 70. On a risk-adjusted basis, older investors were found to decrease their annual returns by 3-5% owing to the adverse effects of aging out-weighing the positive effects of investment experience.

The effect of gender differentials on investment results

The study performed by Powell and Ansic (1997) awarded financial compensation to participants based on their state of wealth at the end of the study. Although the difference was not significant, the results still showed that the mean women's consideration at the end of the study was greater than that of men.

Feng and Seasholes (2008) found that the stock men purchased performed worse by 1.33 basis points per day than the stock women purchased. However, the stock that men sold dropped in value by 1.21 basis points more than the stock women sold. Statistically, the overall performance between men and women showed no difference.

Barber, Lee, Liu and Odean (2009) examined the transactions and underlying order dates from traders in the Taiwanese stock market and found that the stock that individuals sold tended to outperform those that they bought. Barber et al. (2009) gave two reasons as to why uninformed investors were trading speculatively: overconfidence and entertainment. This conclusion is supported in an earlier study

whereby Barber and Odean (2001) concluded that the difference in performance between men and women was as a result of confidence and risk aversion by overconfident men and women. Barber and Odean (2001) challenged the theory that the differences could have resulted from risk aversion alone.

Conclusion

The fact that behavioural biases exist is conclusive in the literature reviewed for this particular study.

The literature appears to show consistently that men are more overconfident than women, and that overconfidence leads to over-trading. There are conflicting views, however, on whether over-trading is as a result of overconfidence alone, or as a result of men being more prone to take risks or whether both points of view are relevant.

Most existing research concludes that over-trading lowers returns, but there is insufficient consistent evidence to support this statement.

An important notion is that it is much easier to get a paper published which shows gender differentials and biases, and there might be gravitas in the notion that a potential research flaw could exist in published literature that researchers have designed studies specifically to uncover gender biases as opposed to other reasons for behavioural differentials (Charness & Gneezy, 2007; Croson & Gneezy, 2009).

Method

Research Questions

The review of literature indicates that women are better investors than men in as much as previous studies indicate that women earn higher average returns than men.

The research questions for this study are as follows:

1. Does trading frequency influence investor return?
2. Do men trade more than women?
3. Do men earn lower returns than women?

The literature reviewed suggests that over-trading could arise from an investor's overconfidence or propensity to take risk. This study is not focused on the cause of over-trading, but rather whether differential investment results arise because of this over-trading.

The null hypothesis is that there is no difference in either trading frequency or investment returns between men and women. If the null hypothesis' are rejected, the implication is that men could be trading more than women due to their overconfidence and heightened risk propensity and that this over-trading lowers return, due to their being more research in favour of this outcome than against it.

Research Approach

Barber and Odean (2001)

The research questions in this dissertation are almost identical to those posed by Barber and Odean (2001). Barber and Odean (2001) showed that overconfidence leads to higher trading owing to overconfident individuals holding unrealistic beliefs about how high their returns will be, holding riskier portfolios, being too willing to act on too little information and expecting to outperform by a greater margin than a rational investor. Barber and Odean (2001) also found that men were more overconfident than women and consequently traded more than women. This over-

trading was found to compromise men's performance (more so than women) owing to the costs levied on the transactions (which were explicitly evident from the data).

Barber and Odean's (2001) data comprised the common stock investments of 37,664 households in which the gender of the person who opened the household's first brokerage account was identifiable.

The primary set of information was from a large discount brokerage firm on the investments of 78,000 households for the six years ending in December 1996. Barber and Odean (2001) were able to obtain end-of-month position statements and trades in order to reasonably estimate the monthly returns earned per household from February 1991 through to January 1997. Investments in mutual funds, American depository receipts, warrants and options were excluded.

The secondary set of information was demographic information compiled by Infobase Inc. (as of June 8, 1997). This data was used to identify the gender of the person who opened a household's first account for 37,664 households. In addition to gender, Infobase provided Barber and Odean (2001) with information such as marital status, age, monthly income and the presence of children in the household.

As spouses could influence one another's investment decisions, the data obtained from Infobase enabled Barber and Odean (2001) to stratify their data on the basis of marital status in order able to draw more detailed conclusions from the dataset.

Research strategy

As a starting point, the possible replication of Barber and Odean's (2001) study using South African data was investigated.

A South African investment house² with records of individual investor performance and limited demographic information was approached in the first instance. The nature of the investment house's investment offerings are collective investment schemes

² The identity of this investment house and data obtained from them is the subject of a non-disclosure agreement and as such is confidential.

(commonly referred to as unit trusts) with various risk profiles; this is distinct from Barber and Odean's (2001) use of stock (equity) portfolios.

Initial specifications were given to the investment house so as to enable them to extract information relating to the return earned over various periods, and the gender and age of individual investors invested in an equity fund.

Owing to capacity constraints at the investment house, return data per individual investor on a per fund basis was not available. However, data over a cross section of funds i.e. aggregate portfolios comprising one or more unit trust investments was available. This approach to the data was considered to be acceptable as it would allow access to a larger population. Furthermore, since the focus of this research is whether or not over-trading results in lower returns, it makes little difference whether an investor is invested in equity or another form of fund as multiple fund holdings do not necessarily affect the investor's ability to trade. Further still, by focusing only on funds trading into and out of an equity fund, the extent of results obtainable would be limited. By way of example, whether an investor moves his or her funds from an equity fund to a money market fund, or from a balanced fund to a flexible fund, the hypothesis remains the same: has the investor lowered his or her return by over-trading?

Further capacity constraints revealed that data would only be available from 1 January 2007 to 31 December 2011 and that the shortest time period for which data could be extracted was three years. The periods were measured over calendar years as follows: 1 January 2007 – 31 December 2009 (three years), 1 January 2008 – 31 December 2010 (three years), 1 January 2009 – 31 December 2011 (three years) and 1 January 2007 – 31 December 2011 (five years, being the complete data set).

The data included only non-advised individual investors and excluded all investments by organisations, staff and group retirement annuity clients as these investments are likely to be advised. The particular emphasis on non-advised investors is in order to allow for behavioural biases between men and women to manifest as opposed to distorting them with the effect of a male financial advisor perhaps investing on behalf of a female client. This approach is consistent with Barber and Odean (2001).

Trading frequency

‘Trading’ in this research is defined as ‘switching’ where an investor moves money between funds on the investment house’s platform. A switch out of one fund and into one or more other funds is counted as one switch, as it pertains to one investment decision being made. A switch frequency count will be calculated which will include all lump sum contributions and redemptions. These are variations ways in which an investor can over-trade, as there is a decision-making process made before making a lump sum contribution or redemption order. Regular investments (i.e. debit orders) are excluded due to the fact that these are often set-up at the inception of the investment and are executed automatically; it may be reasonable to assume that there is less explicit consideration given to these cash flows than to lump sum investments and redemptions, where the decision might be amplified by an assessment of factors such as market price fluctuations.

Research Method

For reasons of confidentiality and privacy, the data provided by the investment house was devoid of any individual investor details. The investment house used the South African identification numbers of individual investors to discern the age and gender of those investors. The author of this study did not perform any return calculations as this would have compromised the confidentiality of the data, but was rather provided with an aggregation of the results of the calculations performed. This data included some 19,021 individual investor returns over the five year and three year periods described previously; each return result was flagged as male or female, and specified in age groupings as follows: under 20 years of age, 20 – 29 years of age, 30 – 39 years of age, 40 – 49 years of age, 50 – 59 years of age and 60+ years of age.

The return, net of switching costs, was calculated using the traditional method for calculating an internal rate of return (IRR). The IRR is considered acceptable as it standardises the return by taking into account the effects of cash flows into and out of collective investment schemes and by doing so accounts for the effect of cash injections and withdrawals on investment return. Owing to the fact that the timing of cash flows could well be differentiated between men and women, this could be a determining factor in differential outcome.

The aggregation of the results and further analyses were performed independently by the author.

In some instances it was noted that a return calculation for a particular investor was not available for all four periods being examined. In these cases, the particular investor was included for analysis of results over the periods for which a return was available, but excluded for analysis of results over the missing periods.

A scanning analytic was performed over the respective populations of results in order to check for any apparent errors or large outliers. The lowest return earned over all populations was -58%, followed by -46%, -44%, -37%, -36% and -32% respectively. The highest return earned was 1,257%, followed by 123%, 84%, 63%, 62% and 57% respectively. Owing to the almost 1000% jump from the 2nd highest to the highest return, the 1,257% observation was excluded from the population, in order to limit any effect that this outlier could have on the results. All other investors were retained in the sample.

The sample is the population of investors at the investment house between 1 January 2007 and 31 December 2011. After sorting all the data into respective groupings, this resulted to sample sizes of:

- 6,184 men and 5,633 women for the 5 years ending 31 December 2011 (Total of 11,817 people)
- 6,988 men and 6,305 women for the 3 years ending 31 December 2009 (Total of 13,299 people)
- 6,494 men and 5,922 women for the 3 years ending 31 December 2010 (Total of 12,416 people)
- 6,184 men and 5,632 women for the 3 years ending 31 December 2011 (Total of 11,816 people)

Research Process

The three research questions are discussed separately below in order to explain how each will be addressed.

Does trading frequency influence investor return?

A correlation test will be performed whereby the number of switches (independent variable) made by individual investors will be correlated against their respective returns (dependent variable) over the five year period 1 January 2007 – 31 December 2011 in order to determine whether trading frequency i.e. number of switches influences investor return. Data on switch frequency was only available for the total five year period. The null hypothesis (H_0) is that there is no correlation between the two variables.

Do men trade more than women?

The central limit theorem states that the sampling distribution of the sample mean will move towards the normal probability distribution and the larger the number of observations in each sample, the stronger the convergence (Lind, Marchal, & Wathen, 2005). A visual test can be performed to support this presumption, which is good practice in confirming that the population is normally distributed.

The population of switches made by individual investors was inspected visually, as shown in Appendix 1, indicating that the distribution of switches is not normally distributed. Owing to this, an alternative test to the two sample t-test will need to be used to compare the mean number of switches made by men and women (as the t-test requires that the two populations follow a normal distribution and have equal population variances).

The Wilcoxon rank-sum test (a non-parametric test) will be used which is based on the average of ranks. The data is ranked as if the observations were part of a single sample. If the ranks of the number of switches are about evenly distributed between the two samples and the average of the ranks for the two samples is about the same, then the null hypothesis (i.e. there is no difference between the trading frequency of men and women) is accepted.

Do men earn lower returns than women?

Relying on the central limit theorem once again and performing a visual test on the population of investor returns in all four data sets i.e. the five year period ending 31 December 2011, and each of the three rolling three-year periods, Appendix 1 shows

that the data appears to be normally distributed in all periods barring the three year period ending 31 December 2011. In order to test whether any difference in the mean return of men and women for each period is statistically significant a z-test will be used for the periods where a normal distribution is evident and the Wilcoxon rank-sum test will be used for the period where normality is not evident.

The decision to use the z-test, as opposed to the t-test is owing to the fact that the research is able to determine the standard deviation of the sample and owing to the large sample size the difference between the z and t values is minor as the t distribution approaches a normal distribution as the sample size increases (Lind et al., 2005).

The null hypothesis is that the returns of both men and women are equal over the respective periods specified.

Ethics

A confidentiality agreement was signed by parties at both the University of Cape Town and the investment house. This was done in order to ensure that the identity of the investment house and all confidential information obtained would be protected from disclosure.

No ethical clearances were required as the study has no interest in racial differences nor were any human participants used in the research.

Limitations/Risks

The study cannot control for the influence that spouses may have on one another's investment decisions. Furthermore, the data did not permit the determination of whether the spouse who opened the account is the one actually making the decisions and using the account. Owing to confidentiality of client information, this study is unable to distinguish between married and single investors; as such, the further insight available from such data is not considered in this instance.

Results

Does trading frequency influence investor return?

A significantly negative correlation at the <0.0001 p-level was found between the number of switches made by investors and their corresponding return (Appendix 2.1). These results are consistent with findings by Barber and Odean (2000), Barber and Odean (2001), Odean (1999) and Sieck and Arkes (2005).

What is observed from the distribution of switches in Appendix 1.1 is that 77% of investors made no switches during the five years ending 31 December 2011, and that 97% of investors made 6 switches or less. Consequently, the correlation test was re-performed having only 6 categories of switches i.e. 0, 1, 2, 3, 4, 5 and 6+ switches. Three percent of the total investors were grouped into the last cohort. The same significantly negative correlation at the <0.0001 p-level was found (Appendix 2.1).

These results show that trading frequency lowers investors return and that investors should rather buy-and-hold than trade vigorously to maximise their return. This may be explained by two phenomena, namely friction (trading costs) and the effects of mistimed trades.

The incurrence of friction costs is supported by Barber and Odean (2001) who state that men trade more and incur higher friction costs as a result of their overconfidence. As the return data in this study was calculated net of trading costs, it follows that lower returns would be observed for investors who traded more frequently.

The effects of buying high and selling low or trading into overpriced assets and trading out of cheap assets is supported by Barber et al. (2009) who found that the stock that individuals sold tended to outperform those that they bought. These mistimed investments resulted in a lower return earned. Barber et al. (2009) reasoned an explanation of this phenomenon whereby traders trade speculatively owing to their overconfidence and want of entertainment.

Do men trade more than women?

Men were found to trade significantly more than women do at the 0.0001 p-level (Appendix 2.2). These results are consistent with findings by Barber and Odean (2001), Bengtsson et al. (2005), Loibl and Hira (2011) and Pompian and Longo (2004). It is noteworthy that the maximum number of switches made by a man (84) was higher than that of a woman (68).

Women were found to switch 0.68 times on average over the five year period ending 31 December 2011 in comparison to men who switched 1.02 times on average (Appendix 2.2). Barber and Odean (2001) used portfolio turnover to approximate trading frequency and found that women turned their portfolios 0.53 times annually in comparison to men who turned their portfolios 0.77 times annually. Barber and Odean (2001) examined actual discretionary stock portfolios in comparison to the examination of collective investment schemes in this study. Nonetheless, the difference between men and women remains apparent.

Odean (1998) stated that overconfident traders will believe in a security more than they should and consequently trade more than could be expected of the theoretical 'rational' trader. This view is supported by Hirshleifer and Ying Luo (2001) who state that overconfident traders trade more aggressively. Also, Barber and Odean (2001) concluded that men, being more overconfident than women, would trade more.

Overconfidence in men is supported by a number of studies including Bengtsson et al. (2005), Bhandari and Deaves (2006), Estes and Hosseini (1988), Furnham (2001), Gysler et al. (2002), Hira and Loibl (2008), Jones and Tullous (2002), Powell and Ansic (1997), Rammstedt and Rammsayer (2002) and Subrahmanyam (2008).

Do men earn lower returns than women?

No statistically significant difference was found between the returns earned by men and women over the 5 year period ending 31 December 2011 in which men earned an average annualised return of 9.10% and women an average annualised return of 9.11% (Appendix 2.3).

Over two of the three-year periods (ending 31 December 2009 and 2010) women were found to earn higher average returns than men at confidence levels of 99% and 85% respectively (Appendix 2.3). For the three year period ending 31 December 2009 men and women earned an average annualised return of 7.80% and 7.96% respectively, whilst for the three year period ending 31 December 2010 men earned an average annualised return of 7.03% in comparison to women who earned an average annualised return of 7.11% (Appendix 2.3).

However, for the three-year period ending 31 December 2011, men were found to earn higher returns at the <0.0001 p-level. In this period, men earned an average annualised return of 12.38% in comparison to women who earned an average annualised return of 11.95% (Appendix 2.3).

Whilst this study shows that over-trading lowers returns and that men trade more than women, the results do not show with any statistical significance that men earn lower returns than women. However, Barclay, Litzenberger and Warner (1990) have shown that the higher the trade frequency, the greater the variance in returns. From this, there is reason to consider that men could have a larger variability in their return, which would allow for the comparison of the risk-adjusted returns of men and women.

Variance in return

An F-test was performed on the data in all four time periods examined in order to test whether the two samples (men and women) are from populations that have equal variances. The null hypothesis is that men and women have the same variance in return. The results from all four tests show that men, at the <0.0001 p-level, have significantly higher variances in return than women (Appendix 2.3).

Variances in return for the respective periods are as follows:

- For the five years ending 31 December 2011, men have a variance in return of 8.76 in comparison to women who have a variance of 5.40 (Appendix 2.3).
- For the three years ending 31 December 2009, men have a variance in return of 15.82 in comparison to women who have a variance of 12.18 (Appendix 2.3).

- For the three years ending 31 December 2010, men have a variance in return of 18.46 in comparison to women who have a variance of 11.75 (Appendix 2.3).
- For the three years ending 31 December 2011, men have a variance in return of 15.93 in comparison to women who have a variance of 13.14 (Appendix 2.3).

Markowitz (1952) set out how, given the choice of two portfolios which earn the same return, a 'rational investor' would choose the one which presents the lowest risk or variance in return.

Given this study's finding that the variability of male returns is statistically significantly higher than that of women, and given that the investment returns of men and women are not statistically different, it follows that women earn better risk-adjusted returns than men.

Analysis of results

The distribution of returns earned by investors in Appendix 1.2 appears to be normal over all periods except for the three-year period ending 31 December 2011. This non-normality could be as a result of the financial crisis which was prevalent at the end of 2008 and the beginning of 2009 (Appendix 3.1). This non-normal period is at the tail-end of the aforementioned financial crisis and after the markets had apparently settled somewhat. The observation that investors tend to sell risky investments and invest the proceeds in riskless assets during market crashes has been supported by a number of studies such as Barber et al. (2009), Feng and Seasholes (2005), Grinblatt and Keloharju (2001) and Odean (1998).

It might be reasonable to presume that women investors (being risk-averse and less prone to trading) who had traded from risky assets into cash during this crisis period would have delayed trading into the risky asset class after the market recovery. This, in turn, would have resulted in men benefiting from the equity market increases (Appendix 3.1) post the financial crisis more than women, which in turn might explain why men earned higher returns than women in the three-year period ending 31 December 2011 (Appendix 2.3).

On an absolute basis, there is no statistically significant difference in the returns earned by men and women. However, on a risk-adjusted basis, women outperform men given the statistically significantly lower variability of women's returns.

Gender differentials based on age

Statistical tests determining whether men trade i.e. switch more than women and whether women earn higher returns than men on an absolute and risk-adjusted basis were re-performed on the data after stratifying into differing age groups as follows: under 20 years of age, 20 – 29 years of age, 30 – 39 years of age, 40 – 49 years of age, 50 – 59 years of age and 60+ years of age. Those investors whose ages could not be determined were excluded from any testing on this stratified basis.

A confidence level was set at 95% and all samples were visually tested for normality (Appendixes 1.3 to 1.8) before deciding whether to perform a z-test or Wilcoxon signed rank test to compare two means. The F-test was used once again to determine differences in variances.

The objective of doing an age analysis was to determine whether or not the trading frequency, return earned or variance in return between men and women within different age groupings is any more or less statistically significant than the overall sample. The objective of this analysis was not to assess whether statistically significant differences in trading frequency, returned earned or variance in return are observable between the age groupings per say.

Under 20 years of age

No statistically significant differences were found between the number of switches made by men in comparison to women, nor in the returns earned by men in comparison to women in any one of the four time-periods analysed (Appendix 2.4.1.2). Furthermore, the only period in which a statistically significant difference was found between the variance of returns between men and women was in the three year period ending 31 December 2009 (Appendix 2.4.1.2). Men were found to have a variance of returns of 6.64 in comparison to women who had a variance of returns of 5.47 (Appendix 2.4.1). The variances for this age group appear to be lower than the

variances of the total sample i.e. all age groups in which men had a variance in return of 15.82 and women a variance in return of 12.18 (Appendix 2.3).

Appendix 4.1 shows a breakdown of the age of investors falling into this particular cohort. The average age is 12 years with the majority of investors being between the age of 7 and 9 years. Whilst it would be impressive to believe that children of this age are making their own investment decisions, it is more likely that their parents are doing so on their behalf. It is indeterminable from the data whether a father is perhaps investing on behalf of his daughter, or a mother investing on behalf of her son. In both of these cases the observed gender cannot be relied upon.

This theory might explain the lower variance of returns seen for this cohort as it can be expected that parents might not be trading speculatively with investments that they are making for their children's future.

It is not possible to draw any gender-specific conclusions from the tests performed on this cohort of investors.

Between 20 and 30 years of age

Men between the age of 20 and 30 years were found to switch statistically significantly more than women, with the average number of switches made by men over the five years ending 31 December 2011 being 0.58 in comparison to women between the age of 20 and 30 years who switched 0.30 times over the same period (Appendix 2.4.2.1).

No statistically significant differences were found between the returns earned by men and women in any one of the four time-periods analysed (Appendix 2.4.2.2). However, men were found to have a statistically significantly larger variance of returns than women for all four time-periods (Appendix 2.4.2.2). These results are consistent with the previous finding that trading frequency increases variance in return.

Barber and Odean (2001) found that young investors hold more volatile portfolios and are more willing to take on risk. The present study's findings were as follows:

- On average, the variance in return seen in this age group is higher than the total sample. For the five year period ending 31 December 2011 and two of the three year periods ending 31 December 2009 and 2011, men between the age of 20 and 30 had a variance in return of 12.64, 18.84 and 21.00 respectively, in comparison to the total cohort of men that had variances in return of 8.76, 15.82 and 15.93 (Appendix 2.4.2.2 and 2.3). For the three year period ending 31 December 2010, women between the age of 20 and 30 had a variance in return of 16.06 in comparison to the total cohort of women who had a variance in return of 11.75 (Appendix 2.4.2.2 and 2.3);
- There are periods in which this age group showed lower variances than the total sample. For the three year period ending 31 December 2009, women between the ages of 20 and 30 had a variance in return of 8.57 in comparison to the total sample of women who had a variance in return of 12.18 and in the three year period ending 31 December 2010, men between the ages of 20 and 30 years had a variance in return of 16.47 in comparison to the total sample of men who had a variance in return of 18.47 (Appendix 2.4.2.2 and 2.3);
- Also, there are periods in which the average variance for this age group is in fact quite similar in comparison to the total sample. For the five year and three year periods ending 31 December 2011, women between the age of 20 and 30 years had a variance in return of 5.61 and 12.90 respectively, in comparison to the total cohort of women who had a variance in return of 5.4 and 13.14 respectively (Appendix 2.4.2.2 and 2.3).

As seen in the total sample, whilst there is no statistically significant difference in returns between men and women between the age of 20 and 30 years, there is a statistically significantly higher variance in return for men. Consequently, on a risk-adjusted basis, it must be concluded that women in this age group are better investors.

Between 30 and 40 years of age

No statistically significant difference between the switch frequencies of men and women is found in this particular age group (Appendix 2.4.3.1). For the three year period ending 31 December 2009, women are found to earn statistically significantly higher returns than men, whilst for the three year period ending 31 December 2011,

men are found to earn statistically significantly higher returns than women (Appendix 2.4.3.2). Three of the four periods examined show men having statistically significantly higher variances in return (Appendix 2.4.3.2). The three year period ending 31 December 2009 shows that women have a statistically significantly higher variance in return (Appendix 2.4.3.2), which runs counter to expectations and the evidence of the total sample.

Potential explanations for the greater average performance by men in the three year period ending 31 December 2011 have been advanced in the analysis of the total sample above. In the three year period ending 31 December 2009 women have statistically significantly higher returns than men, which is in line with results seen in the total sample. The anomaly in this period is that women have a statistically significantly higher variance in return than men. This anomaly should be investigated in subsequent research as such an investigation is beyond the scope of this study.

This same period also shows men and women earning a lower average return than the total sample. Men between the age of 30 and 40 years earned an annualised return of 7.78% in comparison to the total cohort of men who earned an annualised return of 7.80% and women between the ages of 30 and 40 years earned an annualised return of 7.93% in comparison to the total sample who earned an annualised return of 7.96% (Appendix 2.4.3.2 and 2.3).

For all periods except the three year period ending 31 December 2011, both men and women had a statistically significantly higher variance in return than the total sample of investors, which shows an increased propensity to take on risk in this age group.

But for the anomalous observation in the three year period ending 31 December 2009, the results are consistent with what has been observed in the total sample: on a risk-adjusted basis, women are the better investors.

Between 40 and 50 years of age

Men between the age of 40 and 50 years are also found to trade statistically significantly more than women of the same age over the same period (Appendix 2.4.4.1).

The average number of switches made by men and women between the age of 40 and 50 years (0.88 for men and 0.52 for women (Appendix 2.4.4.1)) is less than that of the total sample (1.02 for men and 0.68 for women (Appendix 2.2)). The present study's observation begs the question whether portfolio changes are being made by investors in this age group, and also whether investors in this age group are investing in riskier portfolios as they get older (and closer to retirement age), in order to augment their retirement savings.

In this age group, women earn statistically significantly higher annualised returns for the three year period ending 31 December 2009, whereas men once again earn the statistically significantly higher annualised return for the three year period ending 31 December 2011 (Appendix 2.4.4.2).

For all three of the three year periods measured, men have statistically significantly higher variances in return (Appendix 2.4.4.2).

An observation in this age group of investors is that for all four time-periods, for both men and women, higher variances in return are seen than for the total sample. Although these investors might trade less than the total sample, owing to the nature of their fund selection (potentially higher equity exposure) it might be expected that their variance in return increases. This viewpoint is supported by Yoo (1994) who states that middle-aged investors hold riskier portfolios.

For the five year period ending 31 December 2011 men and women between the age of 40 and 50 years had a variance in return of 10.57 and 9.53 respectively in comparison to the total sample who had a variance in return of 8.76 and 5.4 (Appendix 2.4.4.2 and 2.3). Furthermore, for the three year periods ending 31 December 2009, 2010 and 2011, men between the age of 40 and 50 years had a variance in return of 21.01, 26.01 and 18.00 in comparison to the total sample who had a variance in return of 15.82, 18.46 and 15.93 (Appendix 2.4.4.2 and 2.3). Similarly, women between the age of 40 and 50 years had a variance in return of 13.56, 15.34 and 14.09 in comparison to the total sample of women who had a variance in return of 12.18, 11.75 and 13.14 (Appendix 2.4.4.2 and 2.3).

In this particular age group the same conclusion is made that on a risk-adjusted basis, women are better investors.

Between 50 and 60 years of age

There is no statistical difference between the trading frequencies of men and women between the age of 50 and 60 years (Appendix 2.4.5.1).

Once again, women earn statistically significantly higher annualised returns for the three year period ending 31 December 2009, whereas men earn the statistically significantly higher annualised return for the three year period ending 31 December 2011 (Appendix 2.4.5.2).

For the five year period ending 31 December 2011 and two of the three year periods ending 31 December 2009 and 2010, men have a statistically significantly higher variance in return than women (Appendix 2.4.5.2). For the three year period ending 31 December 2011, women have a statistically significantly higher variance in return than men (Appendix 2.4.5.2).

While no difference in trading frequency and no dominance by one gender in annualised return is observed in the age group, the statistically significantly higher variance in return earned by men remains notably apparent. Owing to this and all else being equal, women between the age of 50 and 60 years are better investors than men of the same age.

Over 60 years of age

Men over the age of 60 years trade statistically significantly more in comparison to women over the age of 60 years (Appendix 2.4.6.1).

Both men and women over the age of 60 years trade more than the total sample of men and women. Men over the age of 60 years switched 1.34 times over the five year period ending 31 December 2011 in comparison to the total sample of men who switched 1.02 times (Appendix 2.4.6.1 and 2.2). Similarly, women over the age of 60 years switched 0.93 times over the same period in comparison to the total sample of women who switched 0.68 times (Appendix 2.4.6.1 and 2.2). This behaviour is supported by Agnew et al. (2003) who found that as an individual approaches

retirement age (65 years in South Africa) his or her financial wealth should have grown over time and the need to reallocate to safer and lower risk funds might explain the increased trading activity. Furthermore, the withdrawal of an annuity from an investment after retiring would also increase the calculated trade frequency.

For the five year period ending 31 December 2011 as well as the three year periods ending 31 December 2009 and 2010, women earn statistically significantly higher returns than men, while men earn the statistically significantly higher return for the three year period ending 31 December 2011 (Appendix 2.4.6.2).

Men over the age of 60 years have statistically significantly higher variances of return than similarly aged women over all four time periods investigated (Appendix 2.4.6.2).

In this particular age group, both men and women are found to have lower variances in return than the total sample. (For the five years ending 31 December 2011 men and women earned a variance in return of 5.74 and 3.47 respectively, in comparison to the total sample of men and women who earned a variance in return of 8.76 and 5.4 (Appendix 2.4.6.2 and 2.3). For the three years ending 31 December 2009, 2010 and 2011, men over the age of 60 years had a variance in return of 9.54, 13.24 and 13.99 in comparison to the total sample of men who had a variance in return of 15.82, 18.46 and 15.93 (Appendix 2.4.6.2 and 2.3). Similarly, women over the age of 60 years had a variance in return of 7.08, 10.42 and 10.50 in comparison to the total sample of women who had a variance in return of 12.18, 11.75 and 13.14 (Appendix 2.4.6.2 and 2.3)).

The lower variances in return show that less risky portfolios are being held by men and women in this age group. This is supported by Korniotis and Kumar (2011) who noted that older and more experienced investors hold less risky portfolios as well as Yoo (1994) who observed that retired investors hold less risky portfolios.

Thirty eight percent of investors in the total sample fell into the age group of 60 years and older (Appendix 4.3.1), which might have the effect of skewing the results of the total sample towards the observations in this age group.

Women over the age of 60 are seen to trade statistically significantly less than men, have statistically significantly lower variances in return, and on average earn statistically significantly higher annualised returns than their male counterparts, making them the better investors.

Conclusion

Across almost all age groups, except in the 30 and 40 year age group and the 50 and 60 year age group, men had a statistically significantly higher trade frequency than women.

Across almost all age groups, except between the age of 20 and 30 years, women were found to earn statistically significantly higher returns than men for the three year period ending 31 December 2009 and men were found to earn statistically significantly higher returns than women for the three year period ending 31 December 2011. It was only amongst investors over the age of 60 years that women were found to earn statistically significantly higher returns than men for the five year period ending 31 December 2011 and the three year period ending 31 December 2010.

No statistically significant difference in the variance of return earned by men and women was noted for investors between the age of 40 and 50 years in the five year period ending 31 December 2011 and investors between the age of 50 and 60 years for the three year period ending 31 December 2011. An anomalous result was observed for the three year period ending 31 December 2009 in which women between the age of 30 and 40 years had statistically significantly higher variances in return than men of the same age. Barring these three observations, for all age groups across all time periods investigated, men had statistically significantly higher variances in return than women.

Investors under the age of 20 years have been excluded from this final conclusion owing to reasons discussed in the analysis of that age grouping earlier in this chapter.

In conclusion, the results within the respective age groups are consistent with those seen for the total sample analysed. On a risk-adjusted basis, women are better investors than men within the various age groups too.

The table below presents a summary of the results of all statistical tests performed across all age grouping as well as for the total sample:

Age group	Total	20 – 30	30 – 40	40 – 50	50 – 60	Over 60
Trade frequency	M	M		M		M
Return 5/2011						W
3/2009	W		W	W	W	W
3/2010						W
3/2011	M		M	M	M	M
Variance in return 5/2011	M	M	M		M	M
3/2009	M	M	W	M	M	M
3/2010	M	M	M	M	M	M
3/2011	M	M	M	M		M

M: Men's trade frequency or return earned or variance in return is statistically significantly higher than that of women's at a 95% confidence level.

W: Women's return earned or variance in return is statistically significantly higher than that of men's at a 95% confidence level.

5/2011: Five years ending 31 December 2011

3/2009: Three years ending 31 December 2009

3/2010: Three years ending 31 December 2010

3/2011: Three years ending 31 December 2011

Exposition of the distribution of returns

Most of the analysis so far points to the conclusion that men have larger variances in return than women as a result of their overconfidence and propensity to trade more than women. It follows that the distribution of men's returns is wider than that of women. The effects of the differential distribution of male and female returns in relation to certain absolute return values was analysed by examining the proportion of the earned returns for each gender that were: (1) less than zero, (2) greater than zero but less than inflation (3) greater than inflation i.e. a real return. A graphical representation of the results is shown in Appendix 5.2.

For all four time periods analysed it can be seen that a larger proportion of men earn negative returns and returns lower than inflation in comparison to women. A larger proportion of women are observed earning a real return i.e. a return greater than inflation. These results illustrate the effects of the greater variance of men's returns.

These observations offer further support to the notion that women are better investors than men, since the data suggests that women have a greater likelihood of earning a real return than men.

Conclusion

Summary of results

A statistically significantly negative correlation was found between the number of switches made by investors and their corresponding returns.

For the total sample of investors, men were found to trade more than women. Upon stratifying the sample into differing age groups this result was not as prevalent with only half of the age groups reflecting that men trade significantly more than women. However, in no age group was it noted that women trade more than men.

No statistically significant difference was found between the returns earned by men and women over the three and five year periods tested, except in the following instances:

- For the three year period ending 31 December 2009 women were found to statistically significantly outperform men for the total sample as well as in most individual age groupings.
- Women over the age of 60 years also outperformed men by a statistically significant margin for both the five year period ending 31 December 2011 and the three year period ending 31 December 2010.
- Counter to these observations, for the three year period ending 31 December 2011 men were found to statistically significantly outperform women for the total sample as well as in most of the individual age groupings. The aberrant result for the three year period ending 31 December 2011 are potentially explained by the gender-specific trading behaviour in the markets over the same period i.e. bear vs. bull markets.

An analysis of the variances in returns earned by men and women showed that men have statistically significantly greater variances in returns than women for the total sample and in all individual age groupings.

Conclusion

Trading frequency lowers investors' return, a phenomenon that the literature reviewed attributes to friction and the effects of mistimed trades. Investors should rather buy-and-hold than trade vigorously to maximise their return.

Men trade more than women. However, no statistically significant difference was found in the absolute returns earned by men and women. Further analysis showed that men have a statistically significantly greater variance in returns than women.

Owing to the lack of a difference in the average returns earned by men and women, the larger variability in returns displayed by men allows the inference that on a risk-adjusted basis, women are better investors!

Recommendations and areas for future research

The presence in the sample of investors as young as 5 years old brings into play a cohort of investors whose investment decisions are most likely being made by an older relative for which no information regarding gender is available in the data set used in this study (the "gender-switching" effect). Although investors under the age of 20 years only encompassed 7% of the total sample of investors, the statistical tests performed could be repeated after excluding any investors below a certain age to eliminate any contamination from gender-switching.

The data used in this study was devoid of any information reflecting whether an investor was married or single. An investor's marital status introduces the possibility that a husband could be investing on behalf of his wife who opened the account or vice versa. Both scenarios again introduce the possibility of gender-switching. A dataset from which individual information as to marital status could be obtained from investors could have provided more comprehensive information on gender differentials. A data set including marital status and other variables (such as the

presence of children in a household) could offer further scope to identify and explain any differential investment performance between the genders.

The potential explanation for men earning higher returns than women during the market recovery after the financial crisis of 2008/9 requires further analysis. A consideration of whether men perhaps perform better in bull markets while women perhaps perform better in bear markets could also be considered in order to further reveal the risk propensities and behaviours of both genders.

An anomaly was identified in the three-year period ending 31 December 2009, in which women between the age of 30 and 40 years earned statistically significantly higher returns than men, whilst at the same time having greater variances in those returns. This result requires further investigation.

An age analysis was performed in this study to determine whether the results for men and women from the total sample are consistent within the various age groups. Further investigation could be performed to determine whether differences in trading frequency, return earned or variances in return are observable between the age groupings themselves.

The sample of investors used in this study was sourced from one investment house. It is possible that the investors in the sample are of a certain type with idiosyncratic behaviour. An improved meta-analysis whereby data is sourced from a larger number of investment houses would broaden the sample of investors and allow for broader observations and greater generalisation of results.

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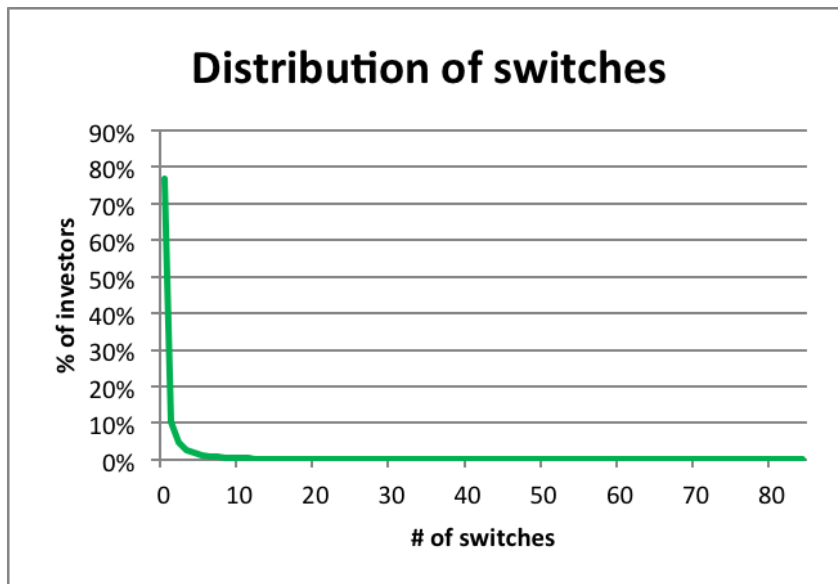
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Appendixes

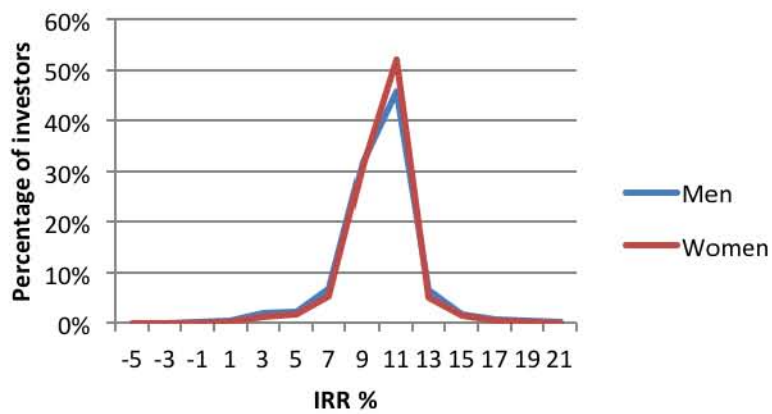
Appendix 1: Visual test for normal distribution

1.1: Distribution of switches

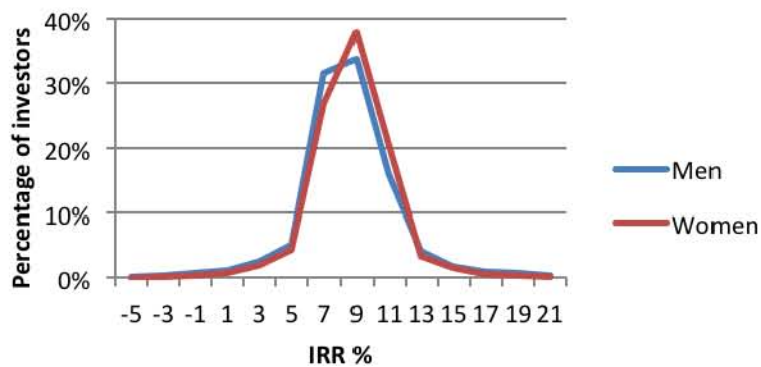


1.2: All investors

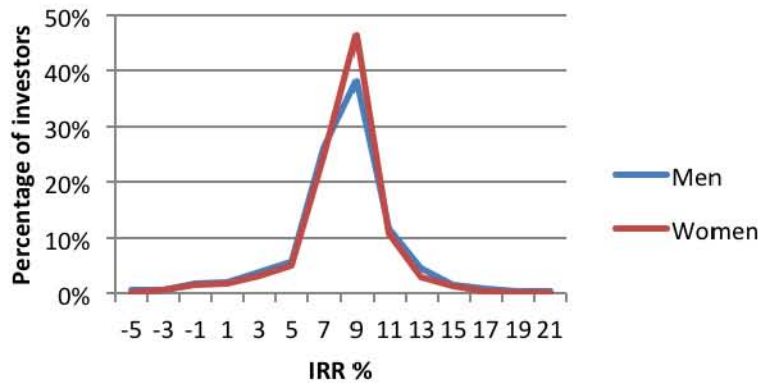
Five year period: 1 January 2007 - 31 December 2011



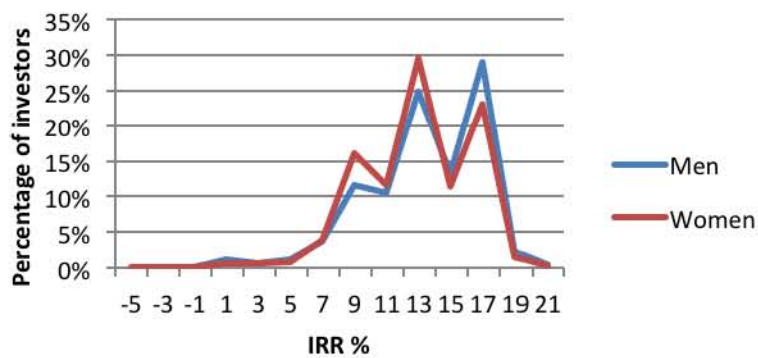
Three year period: 1 January 2007 - 31 December 2009



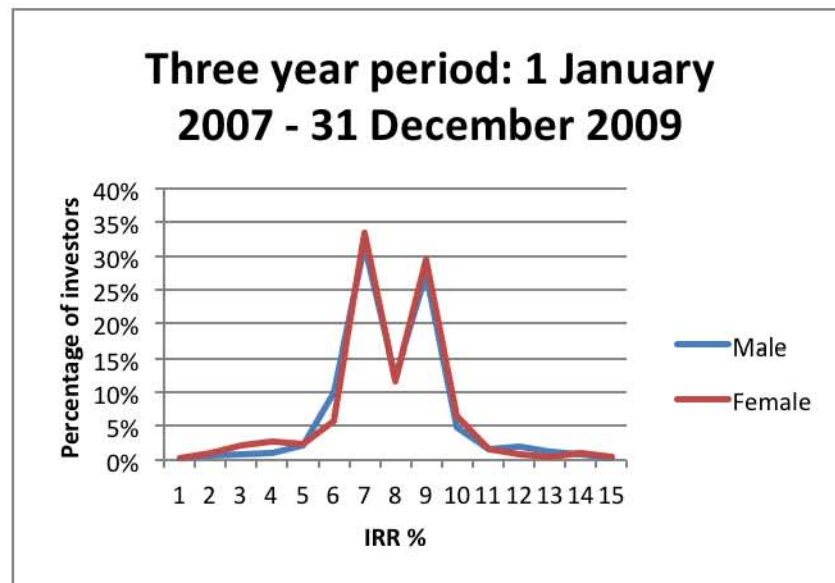
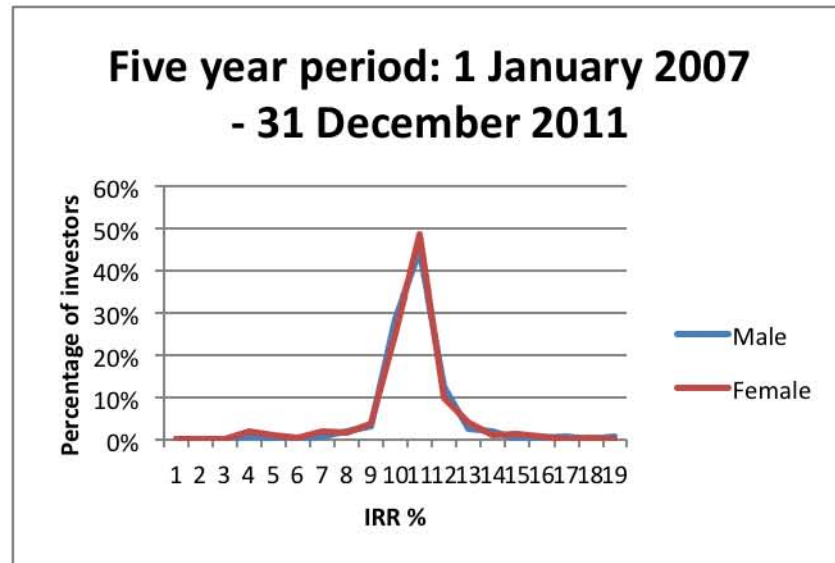
Three year period: 1 January 2008 - 31 December 2010



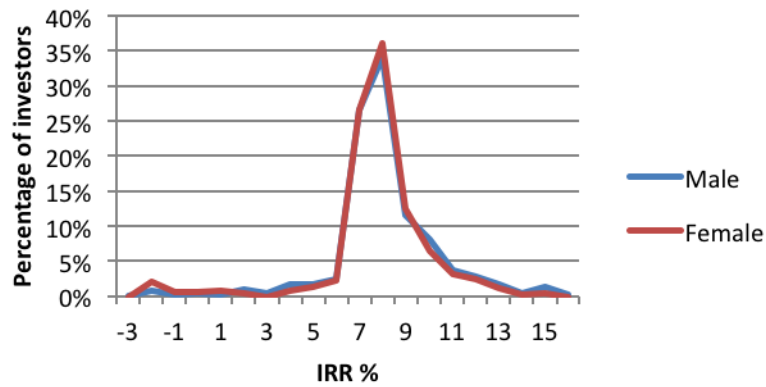
Three year period: 1 January 2009 - 31 December 2011



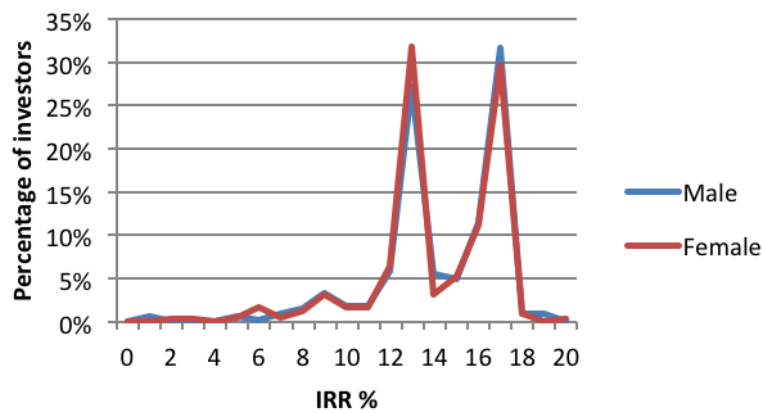
1.3: Investors under the age of 20



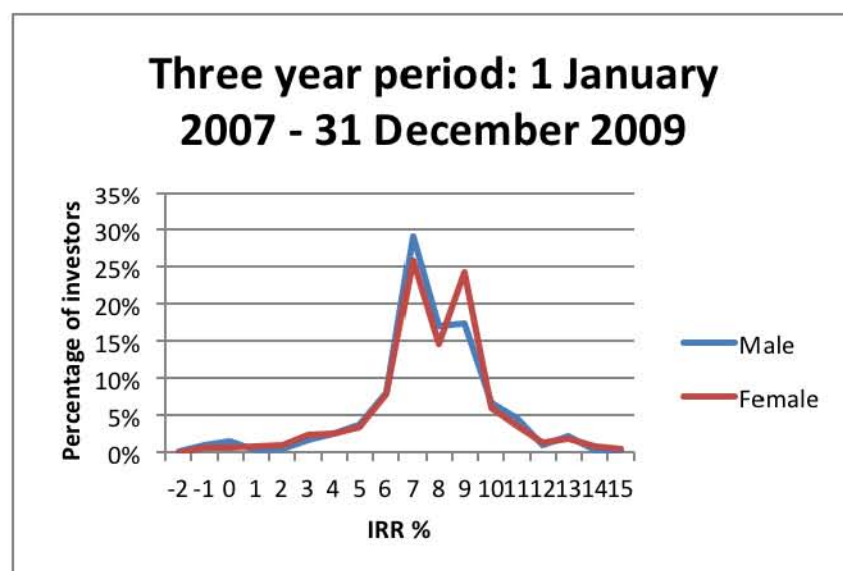
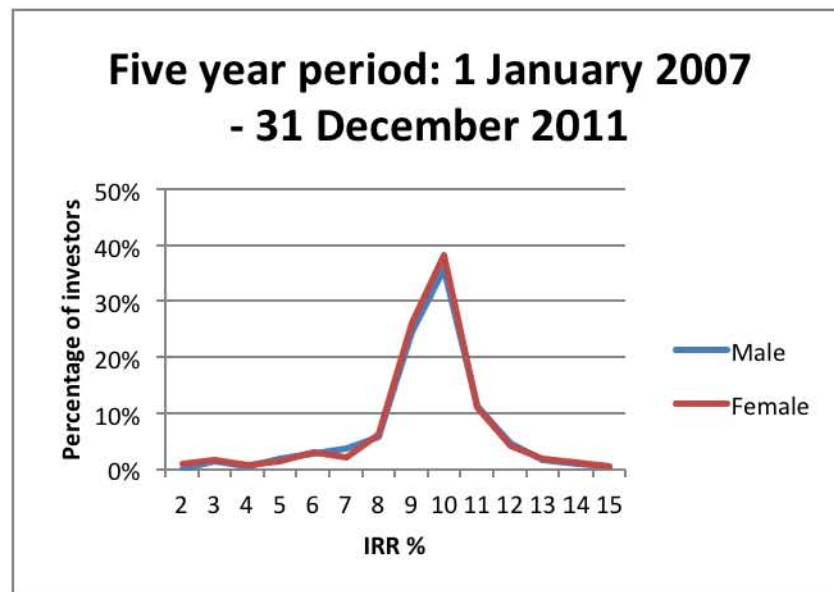
Three year period: 1 January 2008 - 31 December 2010



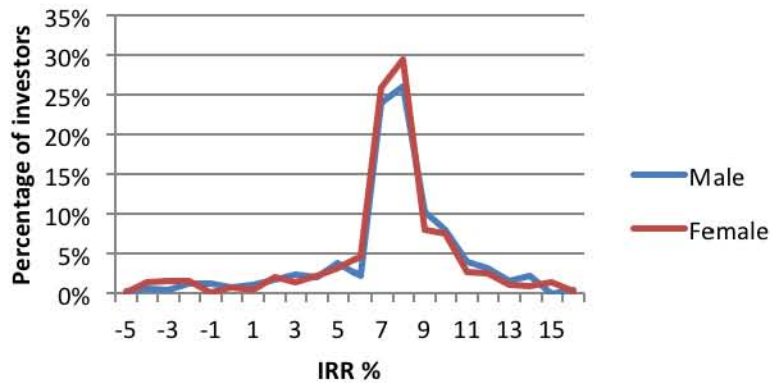
Three year period: 1 January 2009 - 31 December 2011



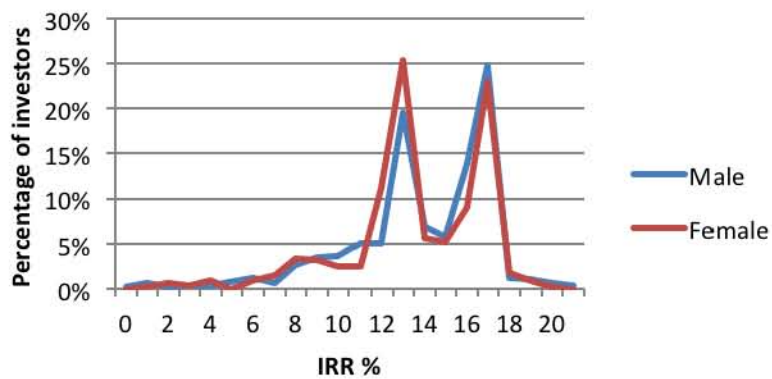
1.4: Investors between the ages of 20 and 30



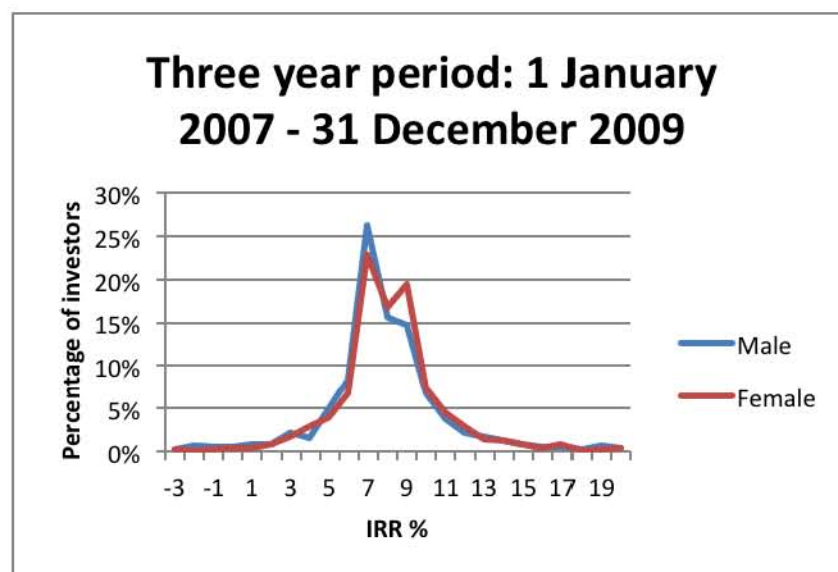
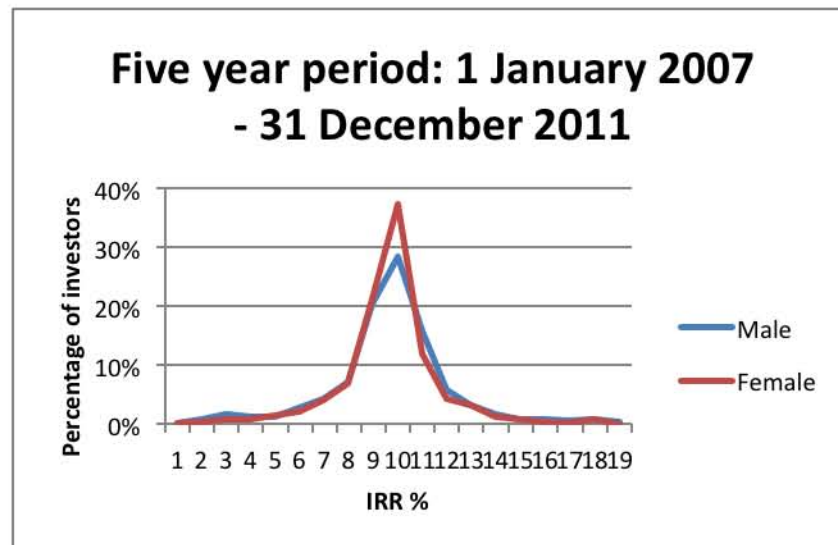
Three year period: 1 January 2008 - 31 December 2010



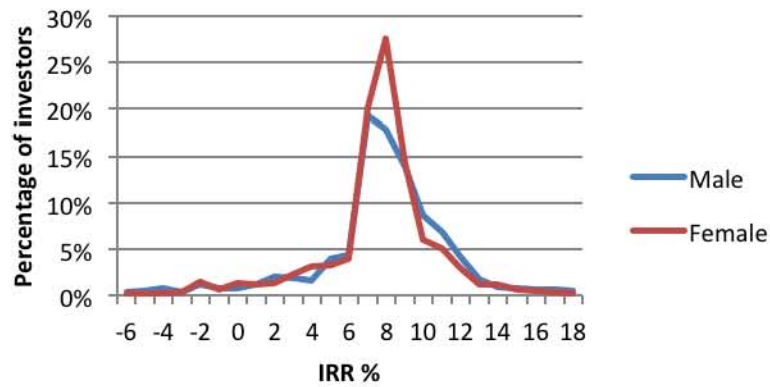
Three year period: 1 January 2009 - 31 December 2011



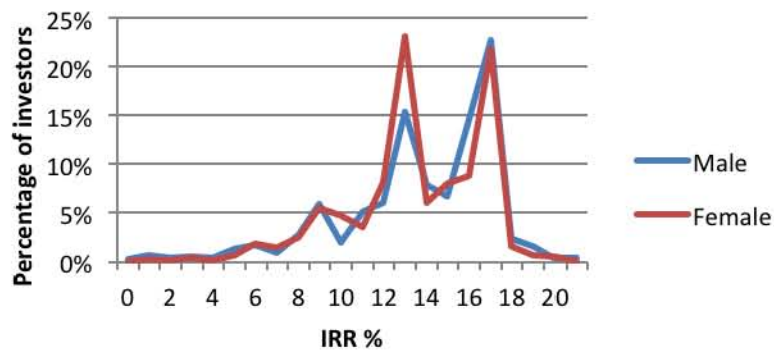
1.5: Investors between the ages of 30 and 40



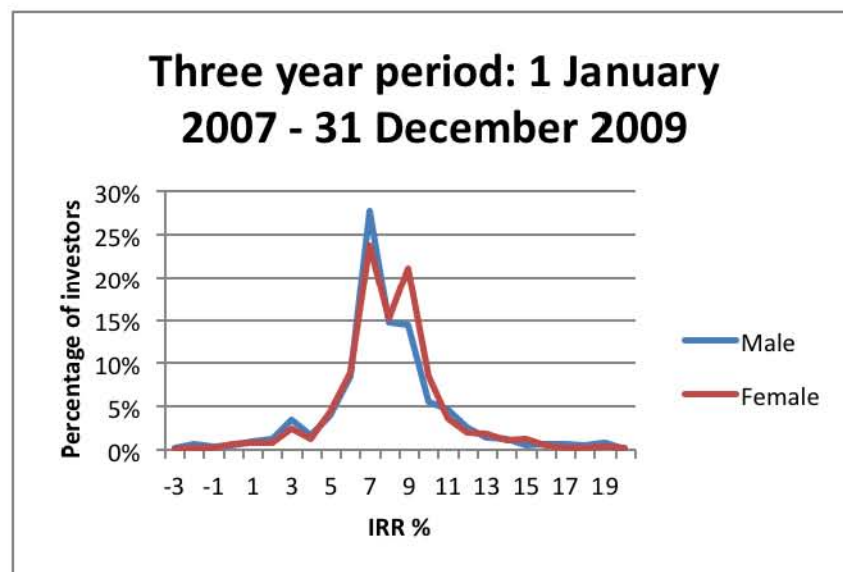
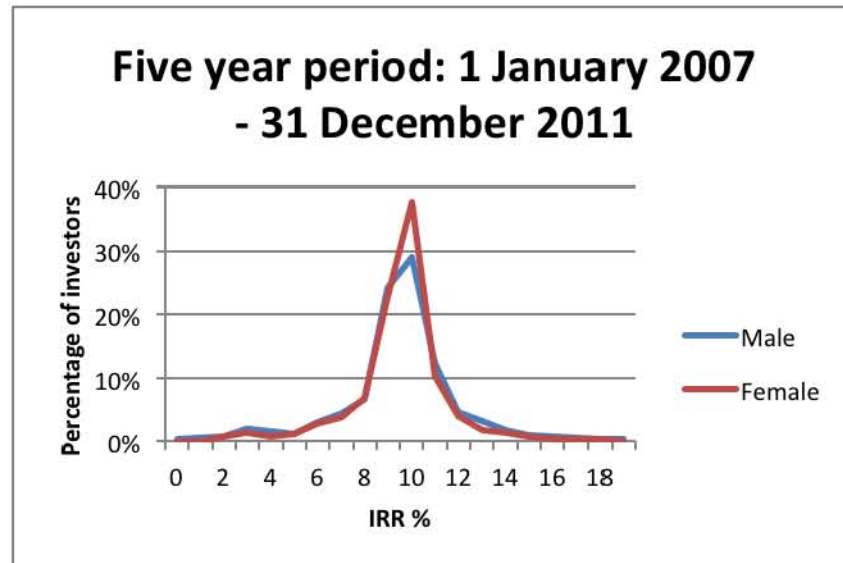
Three year period: 1 January 2008 - 31 December 2010



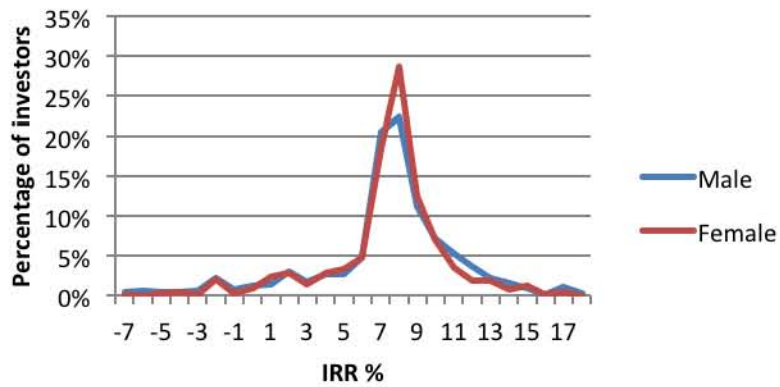
Three year period: 1 January 2009 - 31 December 2011



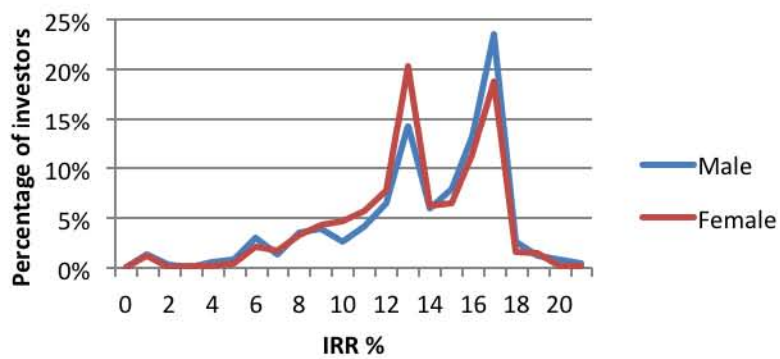
1.6: Investors between the ages of 40 and 50



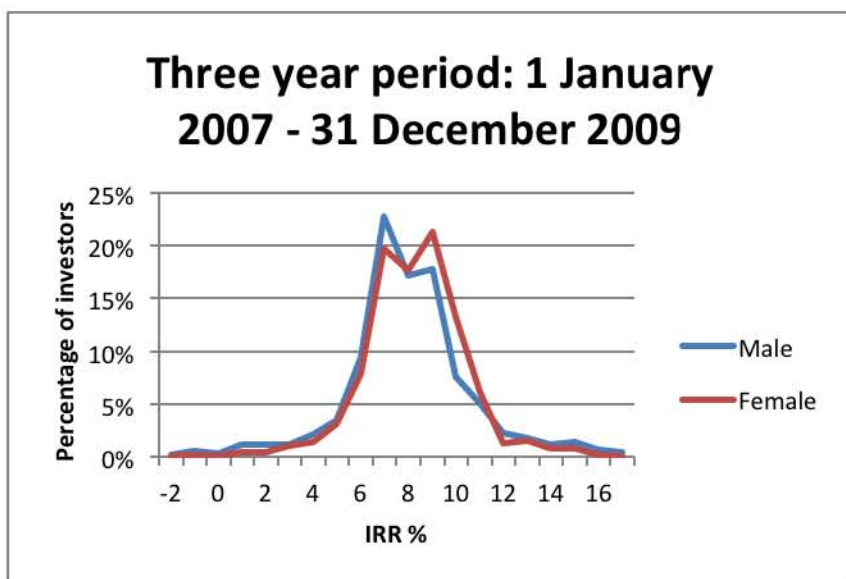
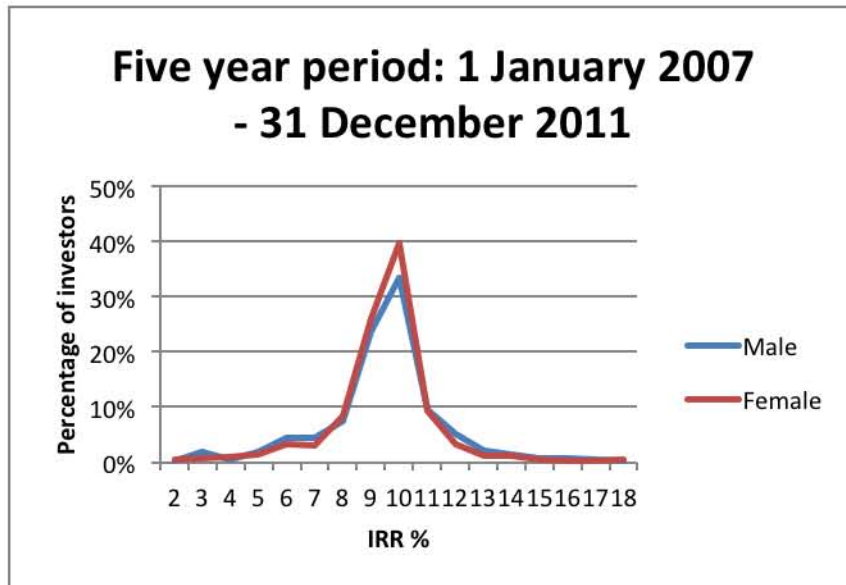
Three year period: 1 January 2008 - 31 December 2010



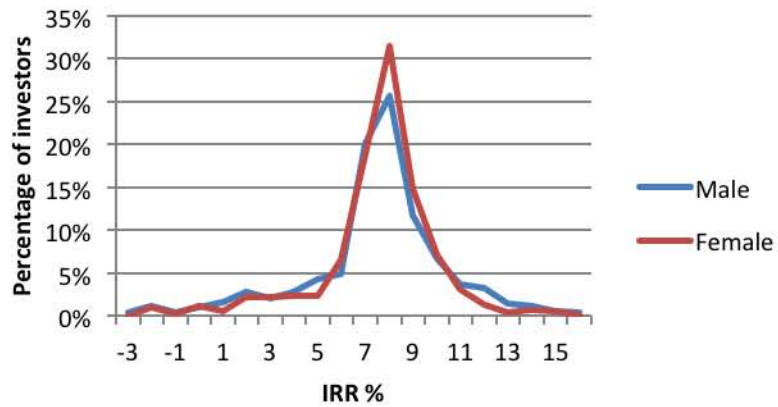
Three year period: 1 January 2009 - 31 December 2011



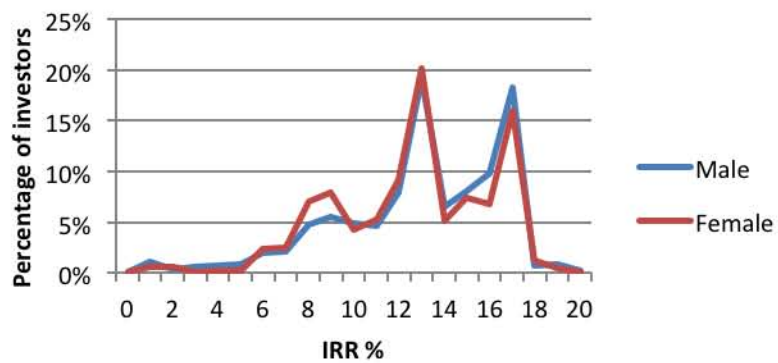
1.7: Investors between the ages of 50 and 60



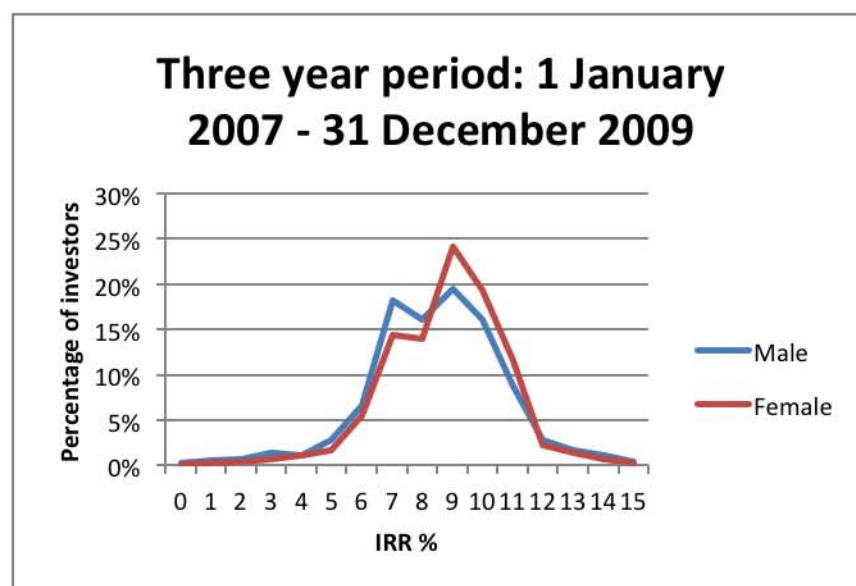
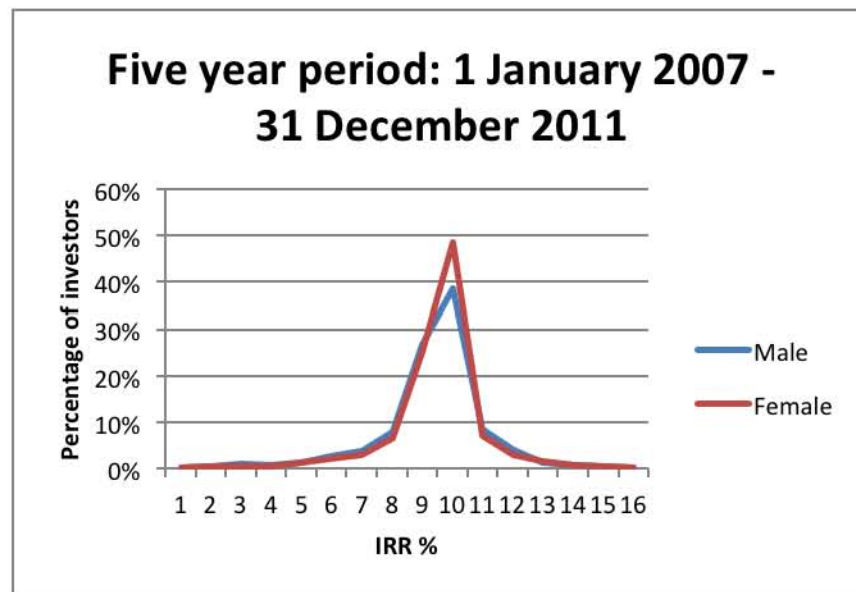
Three year period: 1 January 2008 - 31 December 2010



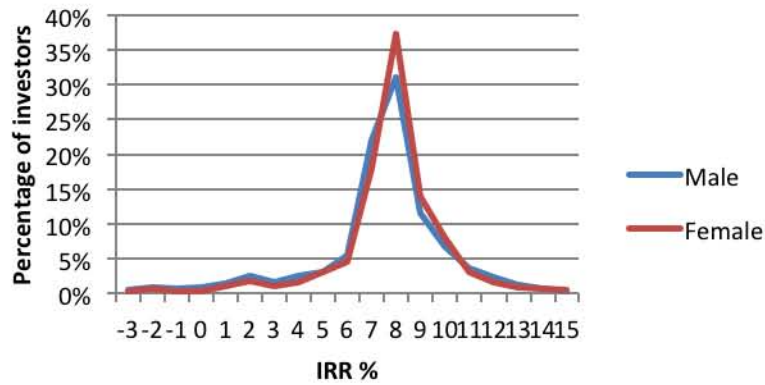
Three year period: 1 January 2009 - 31 December 2011



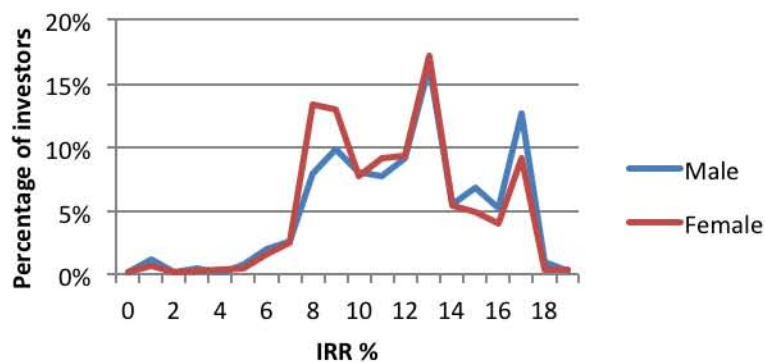
1.8: Investors over the age of 60



Three year period: 1 January 2008 - 31 December 2010



Three year period: 1 January 2009 - 31 December 2011



Appendix 2: Statistical tests

2.1: Correlation between switch frequency and return

	Number of observations	Spearman's rho	P
0 – 84 switches	11,817	-0.1012	<0.0001
0 – 6+ switches	11,817	-0.1016	<0.0001

2.2: Two-sample for mean number of switches

	Number of observations	Maximum	Mean	Standard deviation	Z ^t	P
Men	6,184	84	1.02	4.07		
Women	5,633	68	0.68	2.58		
Total	11,817				3.831 ^w	0.0001

^t An unpaired z-test with one tail will be performed as the numbers of data points within the two samples being compared are different and we expect the mean to move in only one direction i.e. men to trade more than women.

^w Calculated using Wilcoxon rank-sum test which is a two-tailed test

2.3: Two sample for mean return and variance in return

		Number of observations	Mean	Z	P	F	P	Variance
5 years: 1 January 2007 – 31 December 2011	<i>Men</i>	6,184	9.10					8.76
	<i>Women</i>	5,633	9.11					5.4
	<i>Total</i>	11,817		-0.126 ^z	0.45	1.621 ^F	<0.0001	
3 years: 1 January 2007 – 31 December 2009	<i>Men</i>	6,988	7.80					15.82
	<i>Women</i>	6,305	7.96					12.18
	<i>Total</i>	13,293		-2.573 ^z	0.005	1.299 ^F	<0.0001	
3 years: 1 January 2008 – 31 December 2010	<i>Men</i>	6,494	7.03					18.46
	<i>Women</i>	5,922	7.11					11.75
	<i>Total</i>	12,416		-1.147 ^z	0.13	1.571 ^F	<0.0001	
3 years: 1 January 2009 – 31 December 2011	<i>Men</i>	5,632	12.38					15.93
	<i>Women</i>	6,184	11.95					13.14
	<i>Total</i>	11,816		-8.608 ^w	<0.0001	1.212 ^F	<0.0001	

^z Calculated using an unpaired z-test (Alternate hypothesis being that women earn higher returns than men)

^w Calculated using Wilcoxon rank-sum test which is a two-tailed test

^f Calculated using F-test

2.4: Age groupings

2.4.1: Under 20 years of age

2.4.1.1: Two sample for mean return and variance in return

	Number of observations	Maximum	Mean	Z^t	P
<i>Men</i>	444	10	0.30		
<i>Women</i>	424	17	0.29		
<i>Total</i>	868			-0.4140 ^w	0.68

^t An unpaired z-test with one tail will be performed as the numbers of data points within the two samples being compared are different and we expect the mean to move in only one direction i.e. men to trade more than women

^w Calculated using Wilcoxon rank-sum test which is a two-tailed test

2.4.1.2: Two-sample for mean number of switches

		Number of observations	Mean	Z	P	F	P	Variance
5 years: 1 January 2007 – 31 December 2011	<i>Men</i>	444	9.37					2.32
	<i>Women</i>	424	9.20					2.67
	<i>Total</i>	868		1.5598 ^z	0.06	0.8686 ^F	0.07	
3 years: 1 January 2007 – 31 December 2009	<i>Men</i>	479	7.36					6.64
	<i>Women</i>	451	7.23					5.47
	<i>Total</i>	930		0.064 ^w	0.95	1.2146 ^F	0.02	
3 years: 1 January 2008 – 31 December 2010	<i>Men</i>	463	7.67					6.53
	<i>Women</i>	436	7.43					7.39
	<i>Total</i>	899		-0.617 ^w	0.54	0.8843 ^F	0.10	
3 years: 1 January 2009 – 31 December 2011	<i>Men</i>	444	13.63					8.40
	<i>Women</i>	424	13.40					9.76
	<i>Total</i>	868		-0.824 ^w	0.41	0.8601 ^F	0.06	

^z Calculated using an unpaired z-test (Alternate hypothesis being that women earn higher returns than men)

^w Calculated using Wilcoxon rank-sum test which is a two-tailed test

^f Calculated using F-test

2.4.2: Between 20 and 30 years of age

2.4.2.1: Two sample for mean return and variance in return

	Number of observations	Maximum	Mean	Z ^t	P
<i>Men</i>	490	28	0.58		
<i>Women</i>	439	26	0.30		
<i>Total</i>	929			-3.862 ^w	0.0001

^t An unpaired z-test with one tail will be performed as the numbers of data points within the two samples being compared are different and we expect the mean to move in only one direction i.e. men to trade more than women

^w Calculated using Wilcoxon rank-sum test which is a two-tailed test

2.4.2.2: Two-sample for mean number of switches

		Number of observations	Mean	Z	P	F	P	Variance
5 years: 1 January 2007 – 31 December 2011	<i>Men</i>	490	9.16					12.64
	<i>Women</i>	439	8.97					5.61
	<i>Total</i>	929		0.9333 ^z	0.18	2.2555 ^F	<0.0001	
3 years: 1 January 2007 – 31 December 2009	<i>Men</i>	552	7.34					18.84
	<i>Women</i>	471	7.33					8.57
	<i>Total</i>	1,023		1.054 ^w	0.29	2.1968 ^F	<0.0001	
3 years: 1 January 2008 – 31 December 2010	<i>Men</i>	505	6.99					16.47
	<i>Women</i>	451	6.74					16.06
	<i>Total</i>	956		-1.339 ^w	0.18	1.1710 ^F	0.04	
3 years: 1 January 2009 – 31 December 2011	<i>Men</i>	490	13.15					21.00
	<i>Women</i>	439	12.94					12.90
	<i>Total</i>	929		-1.809 ^w	0.07	1.6277 ^F	<0.0001	

^z Calculated using an unpaired z-test (Alternate hypothesis being that women earn higher returns than men)

^w Calculated using Wilcoxon rank-sum test which is a two-tailed test

^f Calculated using F-test

2.4.3: Between 30 and 40 years of age

2.4.3.1: Two sample for mean return and variance in return

	Number of observations	Maximum	Mean	Z ^t	P
<i>Men</i>	1,017	84	0.86		
<i>Women</i>	765	41	0.41		
<i>Total</i>	1,782			-1.536 ^w	0.12

^t An unpaired z-test with one tail will be performed as the numbers of data points within the two samples being compared are different and we expect the mean to move in only one direction i.e. men to trade more than women

^w Calculated using Wilcoxon rank-sum test which is a two-tailed test

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2.4.3.2: Two-sample for mean number of switches

		Number of observations	Mean	Z	P	F	P	Variance
5 years: 1 January 2007 – 31 December 2011	<i>Men</i>	1,017	9.44					15.75
	<i>Women</i>	765	9.37					8.59
	<i>Total</i>	1,782		0.3800 ^z	0.35	1.8338 ^F	<0.0001	
3 years: 1 January 2007 – 31 December 2009	<i>Men</i>	1,116	7.78					26.07
	<i>Women</i>	872	7.93					32.74
	<i>Total</i>	1,988		1.938 ^w	0.05	0.7966 ^F	0.0002	
3 years: 1 January 2008 – 31 December 2010	<i>Men</i>	1,053	7.16					29.21
	<i>Women</i>	804	7.09					12.41
	<i>Total</i>	1,857		-1.704 ^w	0.09	2.3543 ^F	<0.0001	
3 years: 1 January 2009 – 31 December 2011	<i>Men</i>	1,017	13.09					15.61
	<i>Women</i>	764	12.89					10.57
	<i>Total</i>	1,781		-2.602 ^w	0.01	1.4766 ^F	<0.0001	

^z Calculated using an unpaired z-test (Alternate hypothesis being that women earn higher returns than men)

^w Calculated using Wilcoxon rank-sum test which is a two-tailed test

^f Calculated using F-test

2.4.4: Between 40 and 50 years of age

2.4.4.1: Two sample for mean return and variance in return

	Number of observations	Maximum	Mean	Z ^t	P
<i>Men</i>	942	70	0.88		
<i>Women</i>	783	42	0.52		
<i>Total</i>	1,725			-1.945 ^w	0.05

^t An unpaired z-test with one tail will be performed as the numbers of data points within the two samples being compared are different and we expect the mean to move in only one direction i.e. men to trade more than women

^w Calculated using Wilcoxon rank-sum test which is a two-tailed test

2.4.4.2: Two-sample for mean number of switches

		Number of observations	Mean	Z	P	F	P	Variance
5 years: 1 January 2007 – 31 December 2011	<i>Men</i>	942	9.07					10.57
	<i>Women</i>	783	9.17					9.53
	<i>Total</i>	1,725		-0.6201 ^z	0.27	1.1084 ^F	0.07	
3 years: 1 January 2007 – 31 December 2009	<i>Men</i>	1,073	7.61					21.01
	<i>Women</i>	872	7.70					13.56
	<i>Total</i>	1,945		2.400 ^w	0.02	1.5487 ^F	<0.0001	
3 years: 1 January 2008 – 31 December 2010	<i>Men</i>	984	6.89					26.01
	<i>Women</i>	821	6.74					15.34
	<i>Total</i>	1,805		-0.956 ^w	0.34	1.6934 ^F	<0.0001	
3 years: 1 January 2009 – 31 December 2011	<i>Men</i>	942	13.06					18.00
	<i>Women</i>	783	12.67					14.09
	<i>Total</i>	1,725		-3.417 ^w	0.0006	1.2779 ^F	0.0002	

^z Calculated using an unpaired z-test (Alternate hypothesis being that women earn higher returns than men)

^w Calculated using Wilcoxon rank-sum test which is a two-tailed test

^f Calculated using F-test

2.4.5: Between 50 and 60 years of age

2.4.5.1: Two sample for mean return and variance in return

	Number of observations	Maximum	Mean	Z ^t	P
<i>Men</i>	999	65	1.14		
<i>Women</i>	957	68	0.77		
<i>Total</i>	1,956			-0.811 ^w	0.42

^t An unpaired z-test with one tail will be performed as the numbers of data points within the two samples being compared are different and we expect the mean to move in only one direction i.e. men to trade more than women

^w Calculated using Wilcoxon rank-sum test which is a two-tailed test

2.4.5.2: Two-sample for mean number of switches

		Number of observations	Mean	Z	P	F	P	Variance
5 years: 1 January 2007 – 31 December 2011	<i>Men</i>	999	9.04					7.65
	<i>Women</i>	957	8.96					4.95
	<i>Total</i>	1,956		0.7367 ^z	0.23	1.5468 ^F	<0.0001	
3 years: 1 January 2007 – 31 December 2009	<i>Men</i>	1,129	7.74					17.58
	<i>Women</i>	1,074	7.83					10.15
	<i>Total</i>	2,203		2.818 ^w	0.01	1.7316 ^F	<0.0001	
3 years: 1 January 2008 – 31 December 2010	<i>Men</i>	1,048	6.94					18.72
	<i>Women</i>	1,006	7.00					12.10
	<i>Total</i>	2,054		0.335 ^w	0.74	1.5472 ^F	<0.0001	
3 years: 1 January 2009 – 31 December 2011	<i>Men</i>	999	12.27					15.69
	<i>Women</i>	957	11.88					17.38
	<i>Total</i>	1,956		-2.681 ^w	0.01	0.9024 ^F	0.05	

^z Calculated using an unpaired z-test (Alternate hypothesis being that women earn higher returns than men)

^w Calculated using Wilcoxon rank-sum test which is a two-tailed test

^f Calculated using F-test

2.4.6: Over 60 years of age

2.4.6.1: Two sample for mean return and variance in return

	Number of observations	Maximum	Mean	Z ^t	P
<i>Men</i>	2,284	55	1.34		
<i>Women</i>	2,258	66	0.93		
<i>Total</i>	4,542			-2.783 ^w	0.01

^t An unpaired z-test with one tail will be performed as the numbers of data points within the two samples being compared are different and we expect the mean to move in only one direction i.e. men to trade more than women

^w Calculated using Wilcoxon rank-sum test which is a two-tailed test

2.4.6.2: Two-sample for mean number of switches

		Number of observations	Mean	Z	P	F	P	Variance
5 years: 1 January 2007 – 31 December 2011	<i>Men</i>	2,284	8.93					5.74
	<i>Women</i>	2,258	9.08					3.47
	<i>Total</i>	4,542		-2.3344 ^z	0.01	1.6556 ^F	<0.0001	
3 years: 1 January 2007 – 31 December 2009	<i>Men</i>	2,621	8.09					9.54
	<i>Women</i>	2,558	8.36					7.08
	<i>Total</i>	5,179		5.799 ^w	<0.0001	1.3473 ^F	<0.0001	
3 years: 1 January 2008 – 31 December 2010	<i>Men</i>	2,428	6.95					13.24
	<i>Women</i>	2,397	7.30					10.42
	<i>Total</i>	4,825		-4.0377 ^z	<0.0001	1.2700 ^F	<0.0001	
3 years: 1 January 2009 – 31 December 2011	<i>Men</i>	2,284	11.42					13.99
	<i>Women</i>	2,258	10.95					10.50
	<i>Total</i>	4,542		-6.092 ^w	<0.0001	1.3322 ^F	<0.0001	

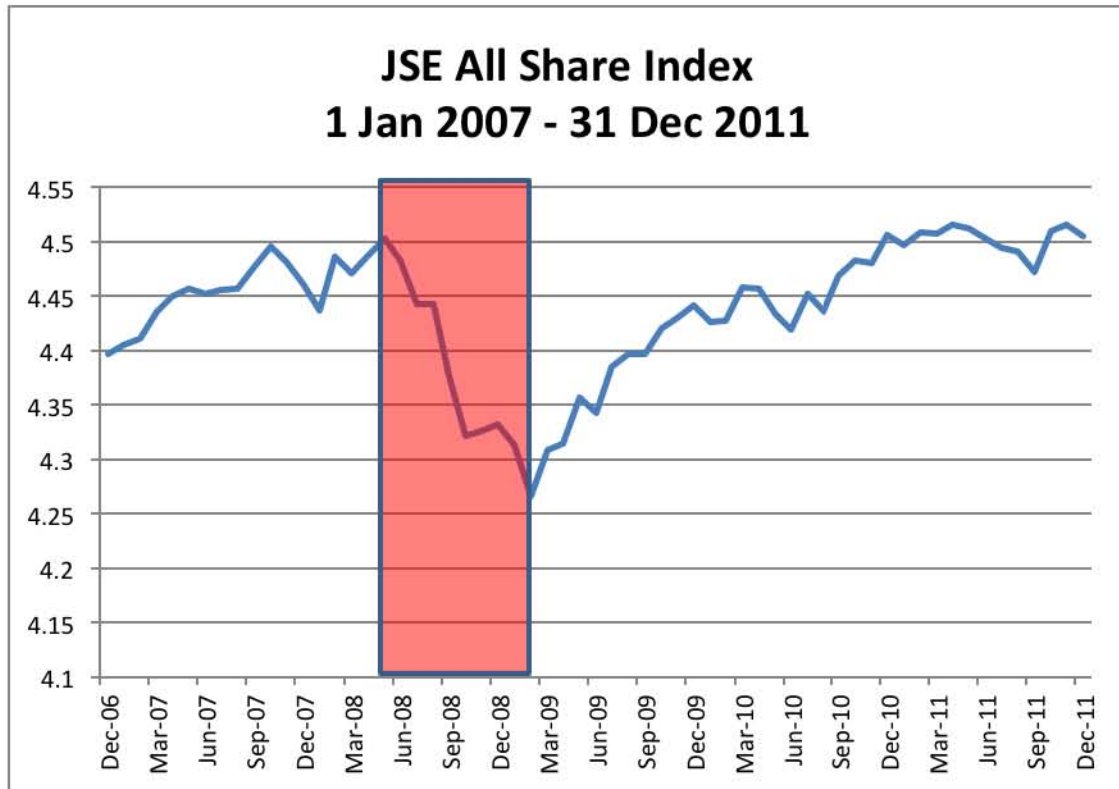
^z Calculated using an unpaired z-test (Alternate hypothesis being that women earn higher returns than men)

^w Calculated using Wilcoxon rank-sum test which is a two-tailed test

^f Calculated using F-test

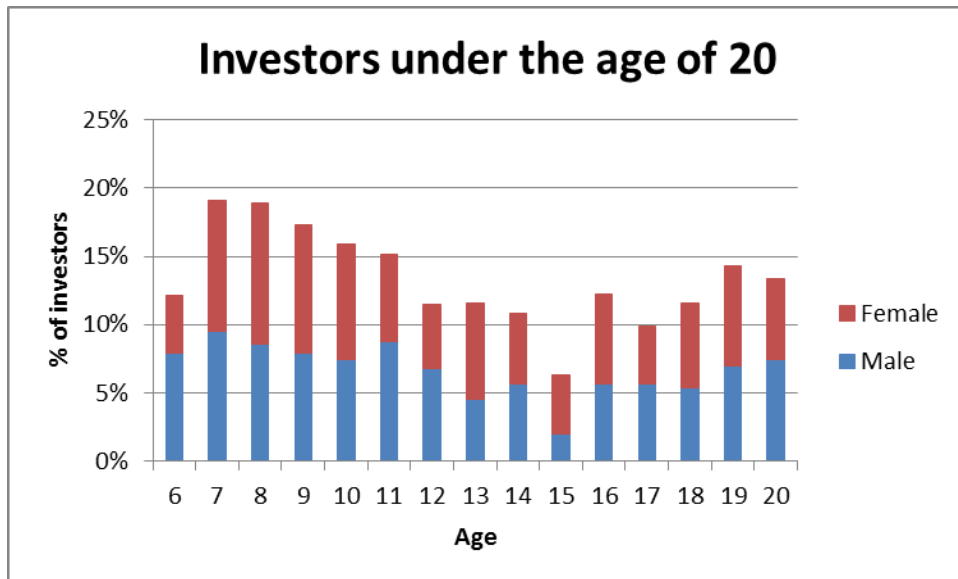
Appendix 3: Market analysis

Appendix 3.1: JSE All Share Index

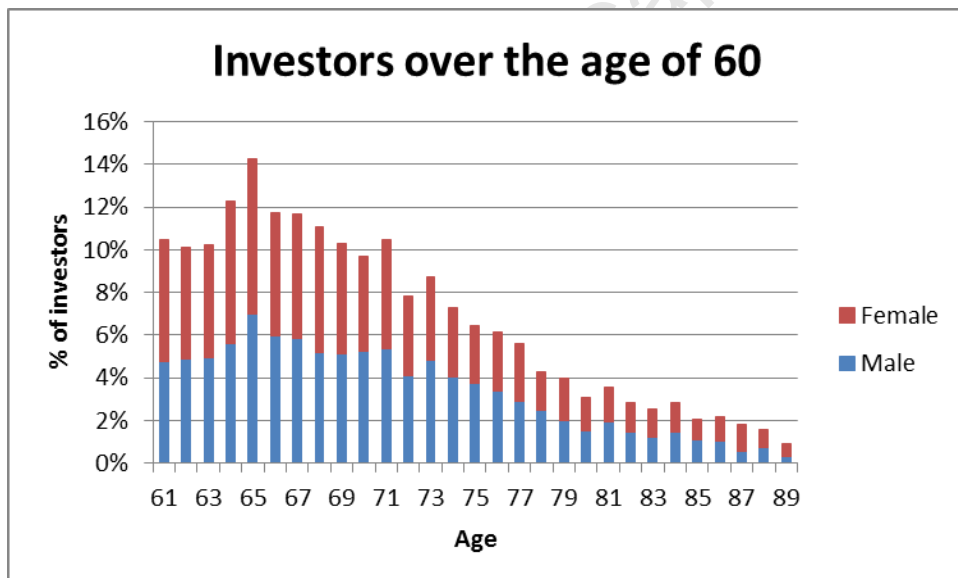


Appendix 4: Age of investors

4.1: Investors under the age of 20



4.2: Investors over the age of 60

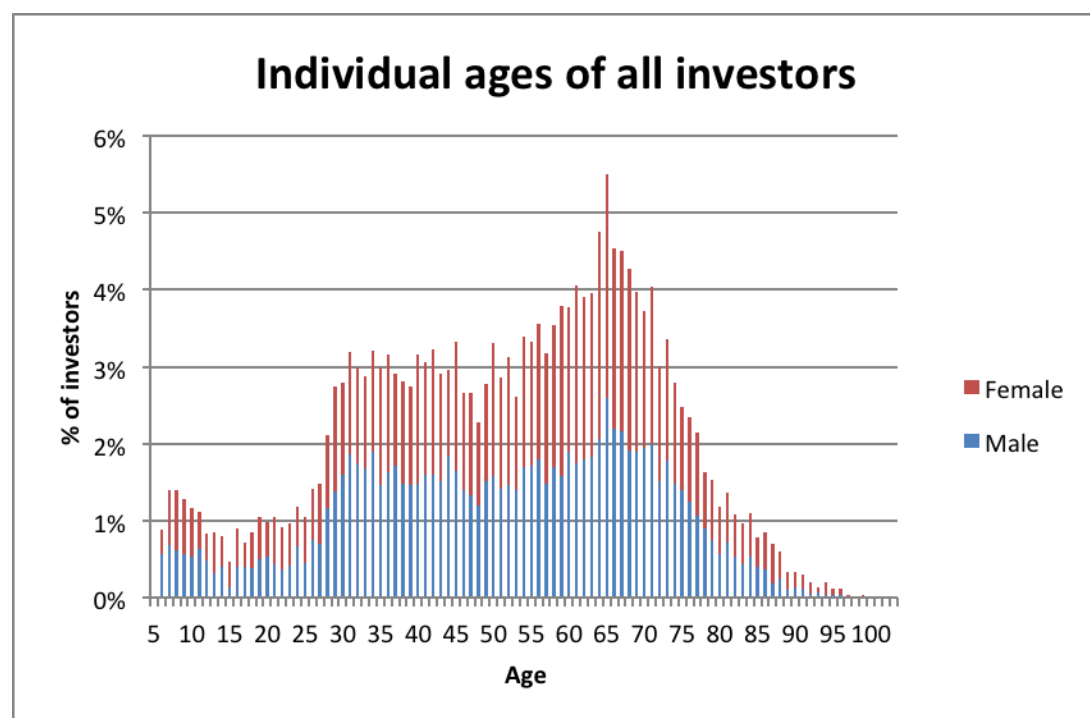


4.3: All investors

4.3.1: Age groupings of investors

Age group	Total	Male	Female
Under 20 years of age	7%	7%	8%
Between 20 and 30 years of age	8%	8%	8%
Between 30 and 40 years of age	15%	16%	14%
Between 40 and 50 years of age	15%	15%	14%
Between 50 and 60 years of age	17%	16%	17%
Over 60 years of age	38%	37%	40%

4.3.2: Individual age of all investors



Appendix 5: Exposition of the distribution of returns

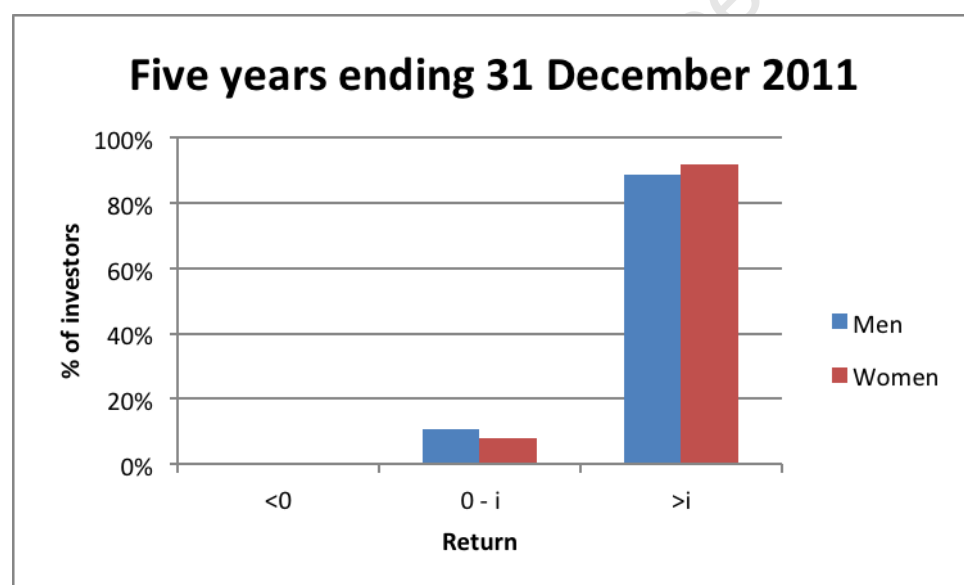
Appendix 5.1: Inflation

	Inflation
5 years: 1 January 2007 – 31 December 2011	6.9%
3 years: 1 January 2007 – 31 December 2009	8.4%
3 years: 1 January 2008 – 31 December 2010	6.7%
3 years: 1 January 2009 – 31 December 2011	5.2%

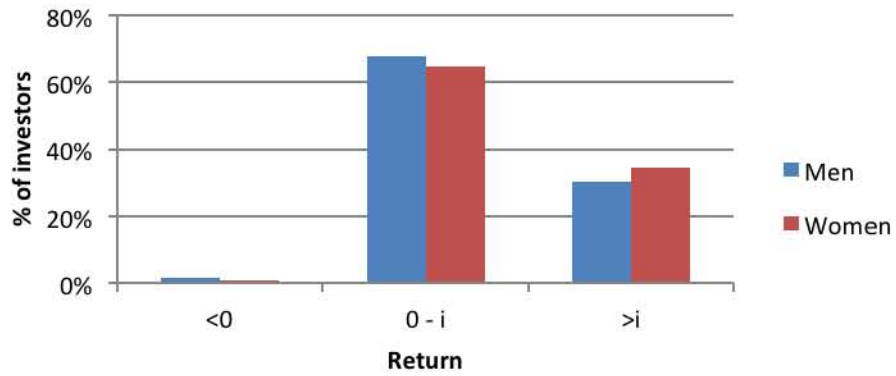
Appendix 5.2: Graphical representation

Key:

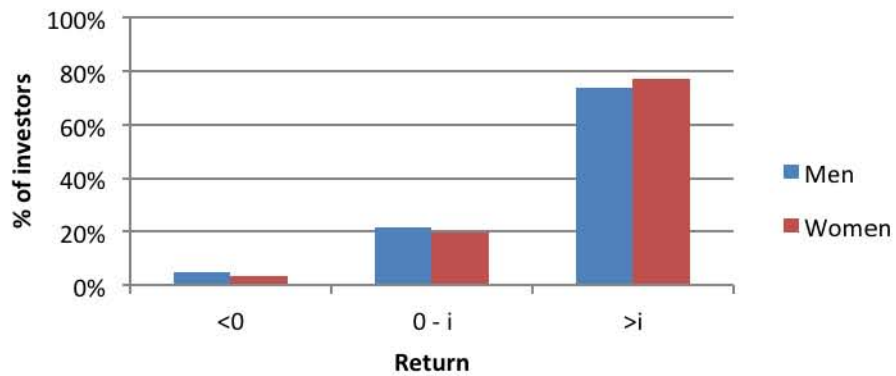
- <0 Returns less than 0%
- 0 – i Returns greater than 0% but less than inflation (Refer to appendix 5.1)
- >i Returns greater than inflation i.e. a real return (Refer to appendix 5.1)



Three years ending 31 December 2009



Three years ending 31 December 2010



Three years ending 31 December 2011

